Week 12: Data Analysis and Interpretation Part II

Dr. T. Kody Frey

Assistant Professor | School of Information Science

Housekeeping

Project Timeline

Only 5 weeks left! 4 groups have been approved by IRB
Goal is to launch survey as soon as possible (workshop tonight will demonstrate steps)
We will work with as many people as we can get!
Group should be working on *front end* (literature review, hypotheses, methods)

What's Next?

Week 13
4/3

Advanced Analyses

This week will focus on complex data analytic techniques that go beyond basic ANOVA and regression methods. The lecture will include a brief introduction to several statistical methods that advance communication science by answering nuanced research questions and hypotheses: structural equation modeling, hierarchical linear modeling, meta-analyses, logistic regression, computational communication / the tidyverse, Bayesian modeling, measurement invariance, and growth curve modeling.

Workshop Topic: Peer Review and Design Feedback

Readings

*Gliner, J. A., Morgan, G. A., & Leech, N. L. (2017). *Research methods in applied settings: An integrated approach to design and analysis* (3rd ed.). Routledge. **Read Ch 22***

Frey, T. K., & Vallade, J. I. (Accepted). Securing the right skills: A longitudinal assessment of college students' writing and public speaking self-efficacy. *Basic Communication Course Annual.* *Copy available in Canvas*

Goodboy, A. K., & Kline, R. B. (2017). Statistical and practical concerns with published communication research featuring structural equation modeling. *Communication Research Reports*, *34*(1), 68-77. https://doi.org/10.1080/08824096.2016.1214121

Walter, N., Cohen, J., Holbert, R. L., & Morag, Y. (2020). Fact-checking: A meta-analysis of what works and for whom. *Political Communication*, *37*(3), 350-375. https://doi.org/10.1080/10584609.2019.1668894

Reaction Paper #9

Overview of Today

Variable Relationships!

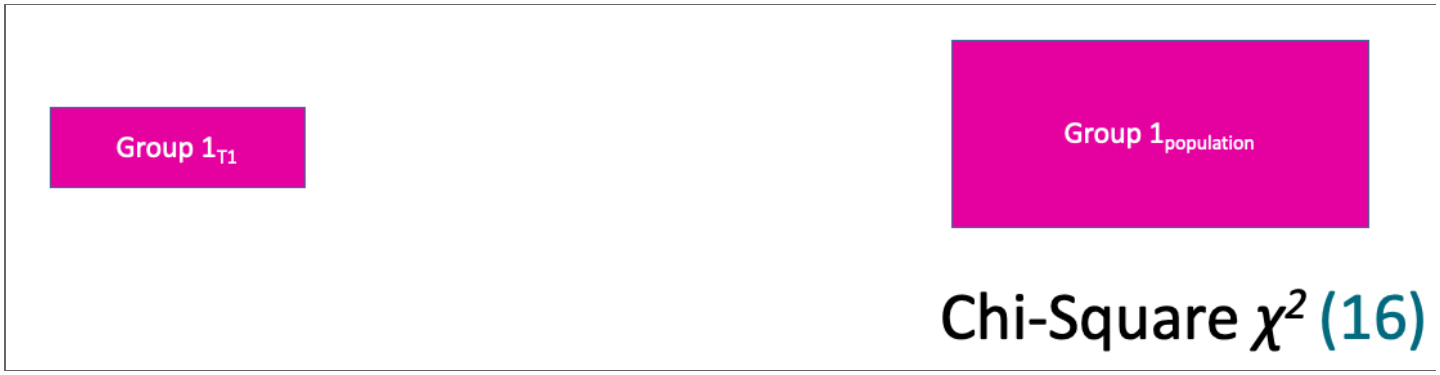
- Brief Review
- Correlation
- Partial Correlation
- Multiple Regression

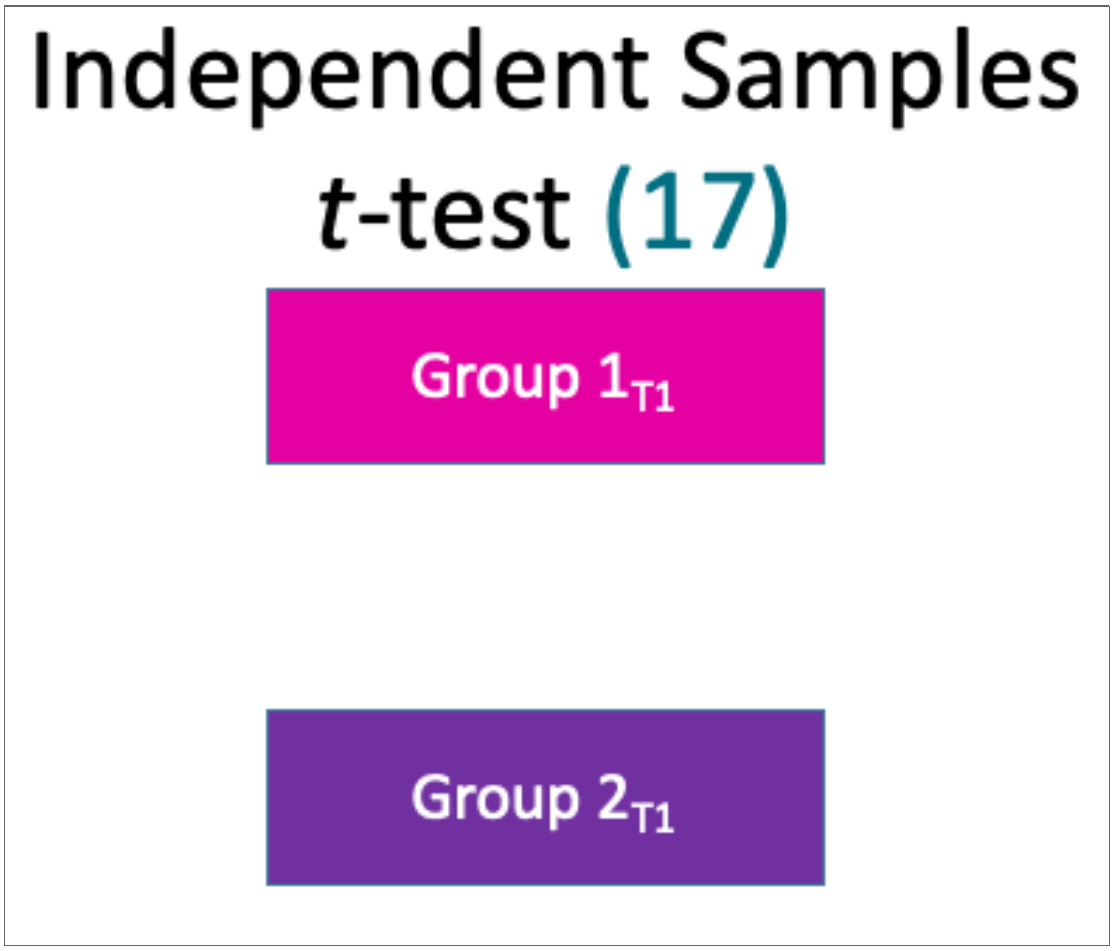
Brief Review on BG and WS Difference Tests

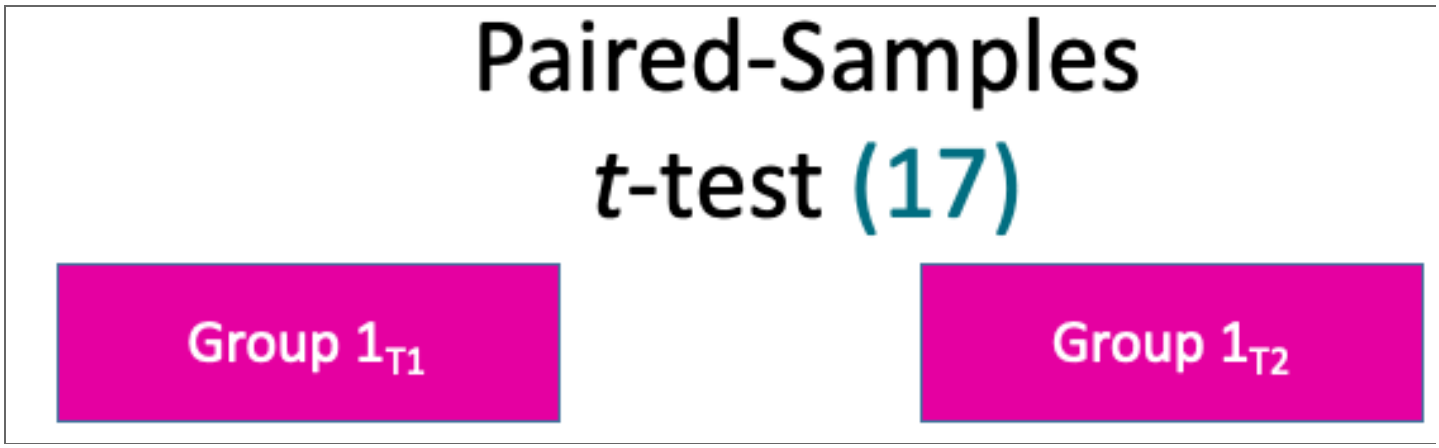
Already Covered:

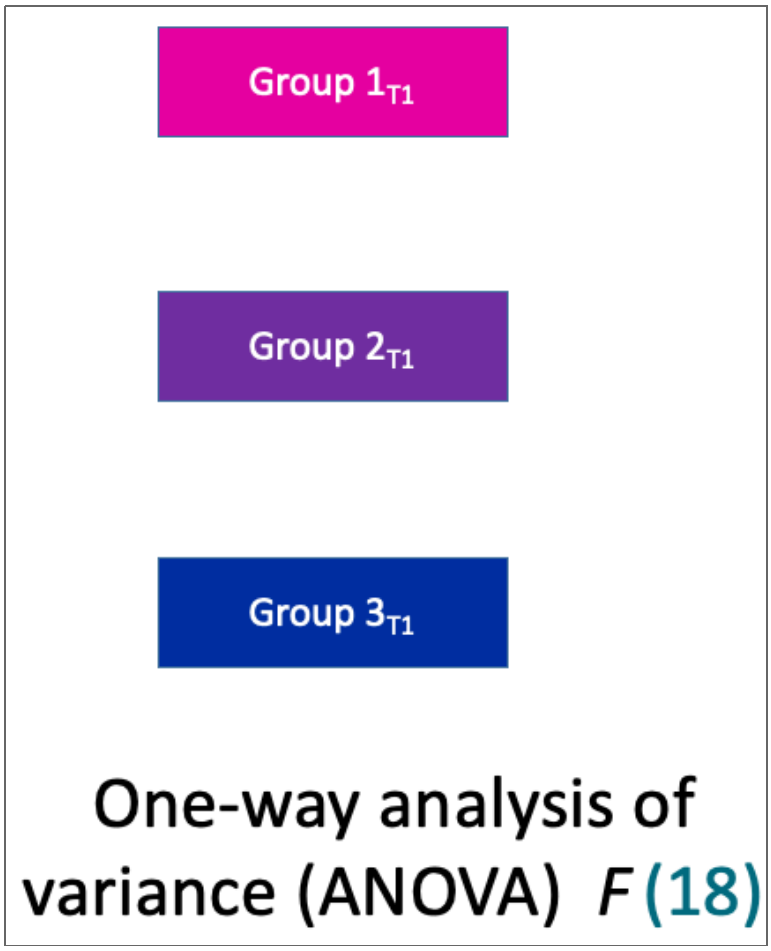
- Descriptive Statistics
- Inferential Statistics
- Nonparametric tests (Chi-Square)
- Group Differences (t-tests)
- ANOVA, Factorial ANOVA, ANCOVA, MANOVA, Repeated Measures MANOVA

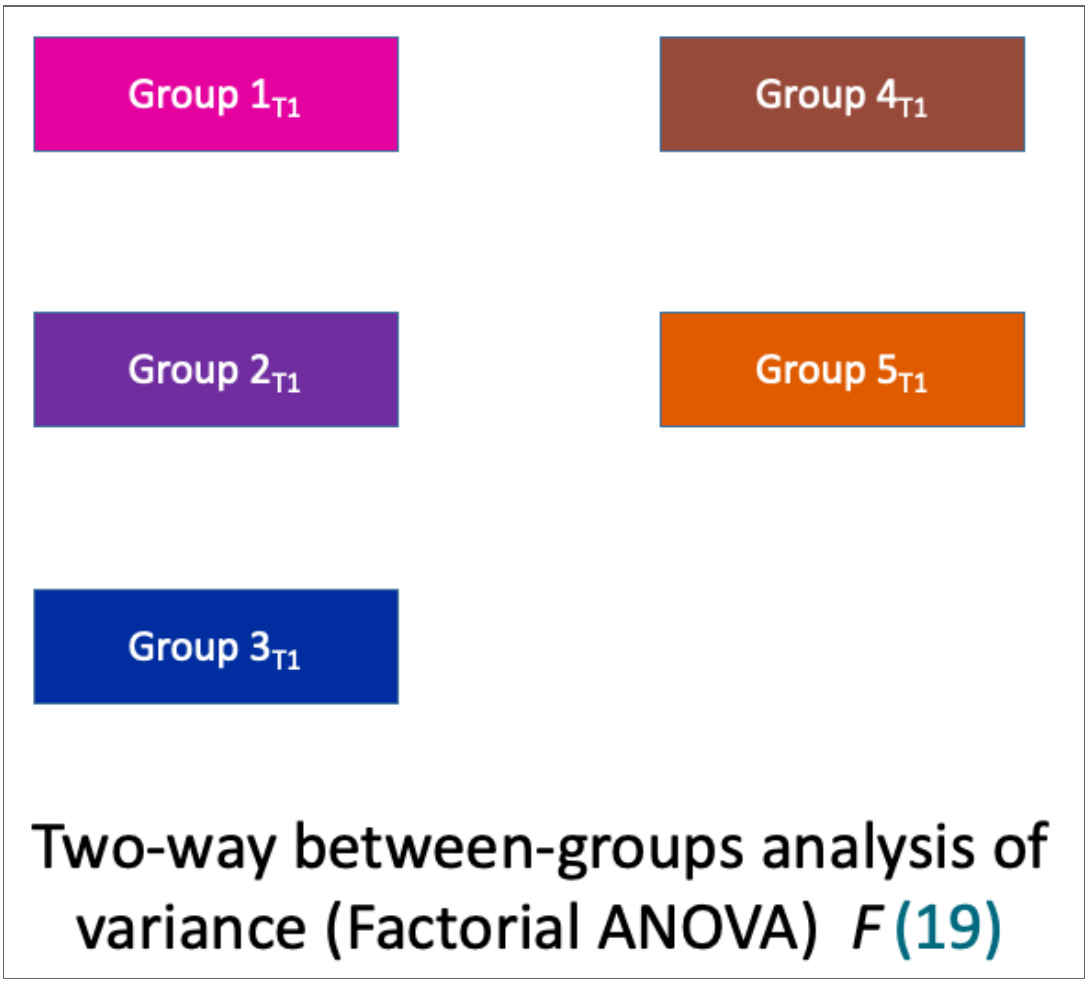
Visualizing

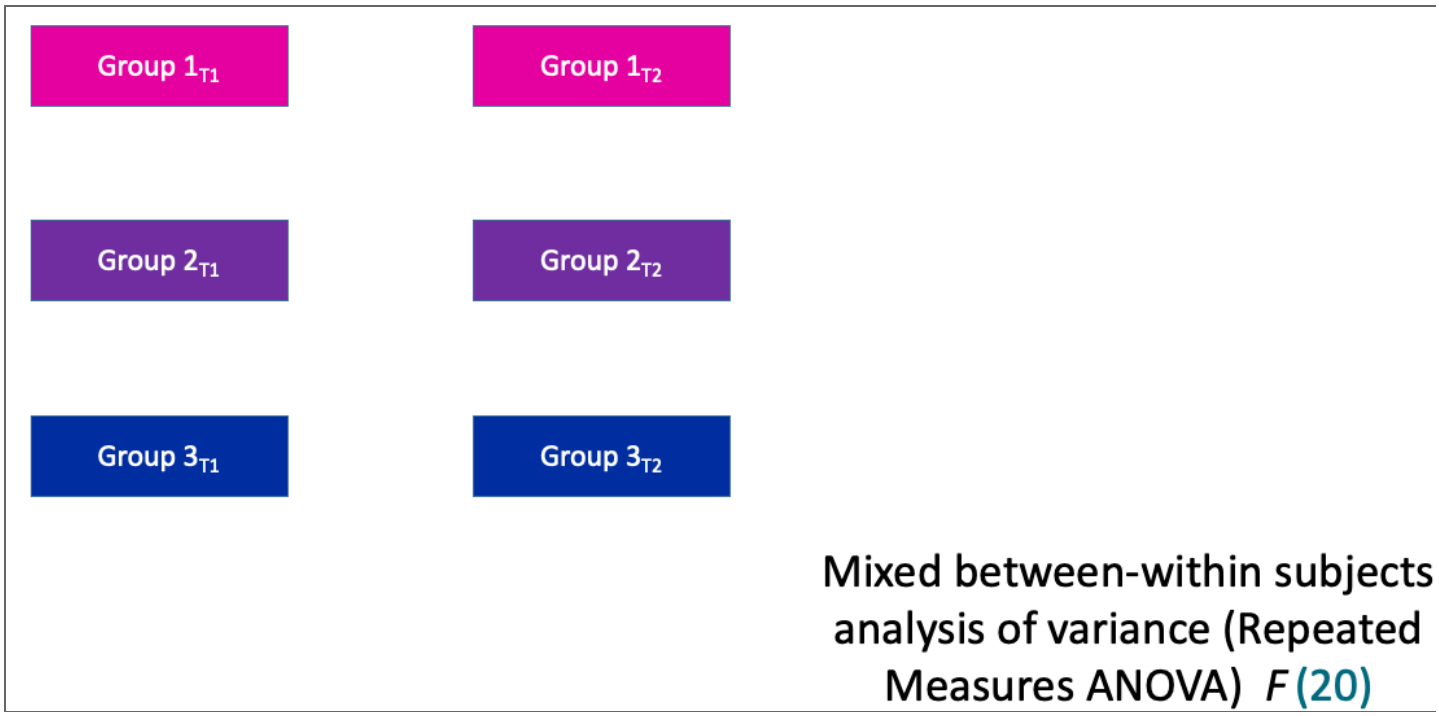


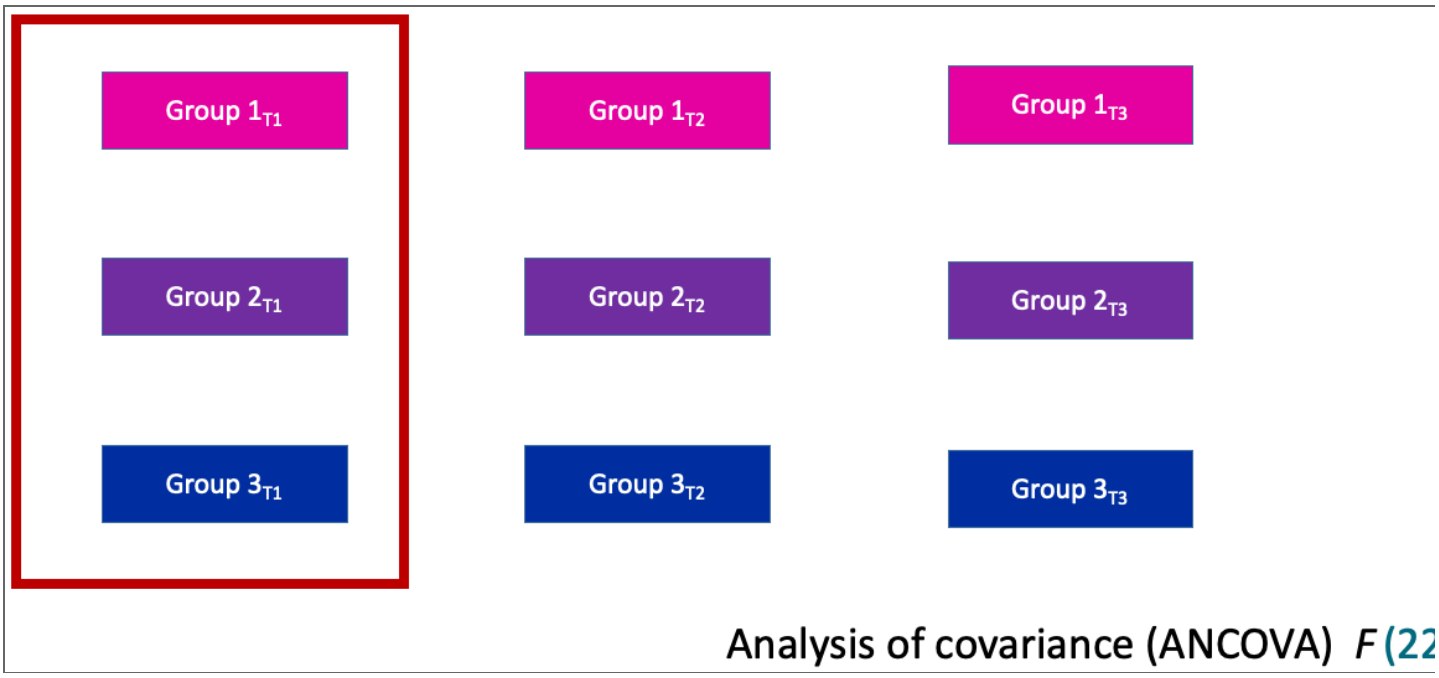

Independent Samples
t-test (17)
Group 1T1
Group 2T1


Paired-Samples
t-test (17)
Group 1T1
Group 1T2


Group 1_{T1}
Group 2_{T1}
Group 3_{T1}
One-way analysis of variance (ANOVA) $F(18)$


Group 1_{T1}
Group 4_{T1}
Group 2_{T1}
Group 5_{T1}
Group 3_{T1}
Two-way between-groups analysis of variance (Factorial ANOVA) $F(19)$


Group 1_{T1}
Group 1_{T2}
Group 2_{T1}
Group 2_{T2}
Group 3_{T1}
Group 3_{T2}
Mixed between-within subjects analysis of variance (Repeated Measures ANOVA) $F(20)$


Group 1_{T1}
Group 1_{T2}
Group 1_{T3}
Group 2_{T1}
Group 2_{T2}
Group 2_{T3}
Group 3_{T1}
Group 3_{T2}
Group 3_{T3}
Analysis of covariance (ANCOVA) F (22

Quick Knowldge Check

What is the difference between a One-way ANOVA and a Factorial ANOVA?

Real Life

H1a-c: Instructor syllabus policies with greater controlling language will produce a) increased threat to freedom, b) increased reactance, and c) decreased intent to comply than syllabus policies with less controlling language.

H2a-c: Instructor syllabus policies perceived as unfair will produce a) increased threat to freedom, b) increased reactance, and c) decreased intent to comply than syllabus policies perceived as fair.

Real Life

Comparing Means | Threat to Freedom | Reactance | Compliance

2 x 2 Factorial Design

Table 1. Effects of controlling language and fairness on dependent measures.

Variable	Controlling Language	Fairness: Fair	Fairness: Unfair	Significant Effects
Threat to freedom	Low	2.49 (0.95)	3.56 (0.94)	L*
	High	3.27 (1.11)	3.71 (1.04)	F*
				LF*
Reactance	Low	−1.53 (1.49)	.96 (1.43)	L*
	High	−.37 (1.69)	.86 (1.70)	F*
				LF*
Intent to comply	Low	5.27 (1.19)	4.83 (1.44)	L*
	High	4.55 (1.27)	4.67 (1.48)	LF**

L = main effect for controlling language, F = main effect for fairness, LF = two-way interaction; ** $p < .10$, * $p < .05$.

The analysis revealed significant main effects of controlling language, $F(1, 301) = 16.16$, $p < .001$, $\eta 2 = .05$, and fairness, $F(1,301) = 41.66$, $p < .001$, $\eta 2 = .12$, as well as **a significant interaction**, $F(1, 301) = 7.41$, $p < .01$,$\eta 2 = .02$.

The analysis revealed significant main effects of controlling language, $F(1, 301) = 8.60$, $p < .01$, $\eta 2 = .03$, and fairness, $F(1, 301) = 104.26$,$p < .001$, $\eta 2 = .26$, as well as **a significant interaction**, $F(1, 301) = 11.91$, $p < .001$, $\eta 2 = .04$.

The analysis revealed a significant main effect of controlling language, $F(1, 301) = 8.03$, $p < .01$, $\eta 2 = .03$, and a marginally significant interaction, $F(1, 301) = 3.22$, $p = .07$, $\eta 2 = .01$; the fairness main effect was not significant, $F(1, 301) = 1.01$, $p = .32$, $\eta 2 = .00$.

What Test is Appropriate!

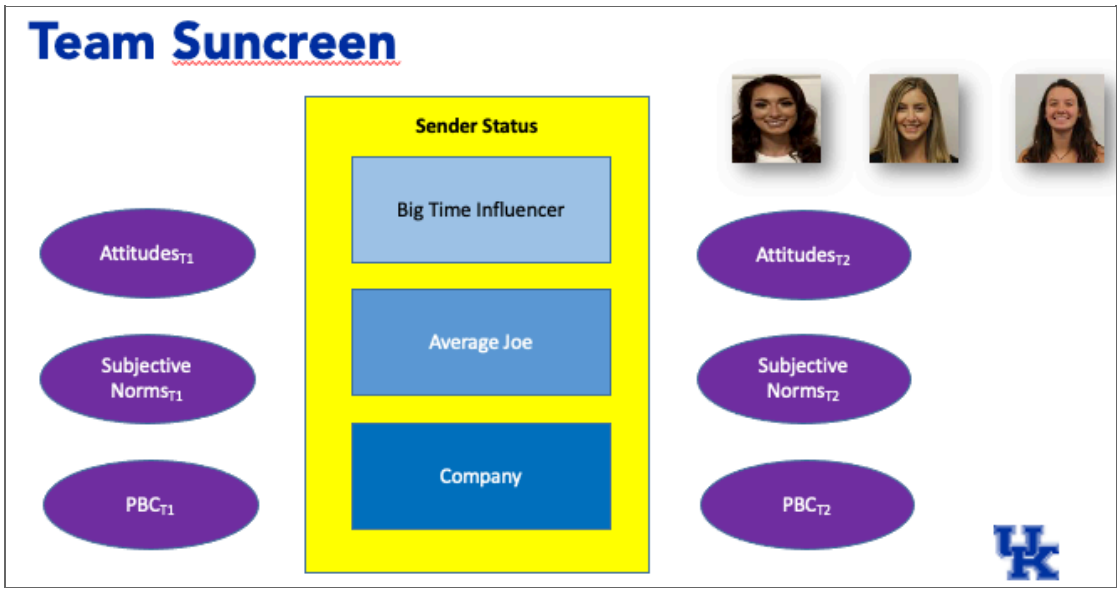
- 1 between groups IV (2 levels), 1 normally-distributed DV
  - EX: Do men and women differ in stats achievement?
- 2 categorical variables
  - EX: Is gender associated with political party preference?
- A 2 x 3 between subjects design, 1 normally-distributed DV
  - EX: Do gender and class time (morning, noon, night) interact to affect achievement?
- 1 between groups IV (4 levels), 1 normally-distributed DV
  - EX: Do NCAA basketball tournament regions differ in terms of field goal percentage?

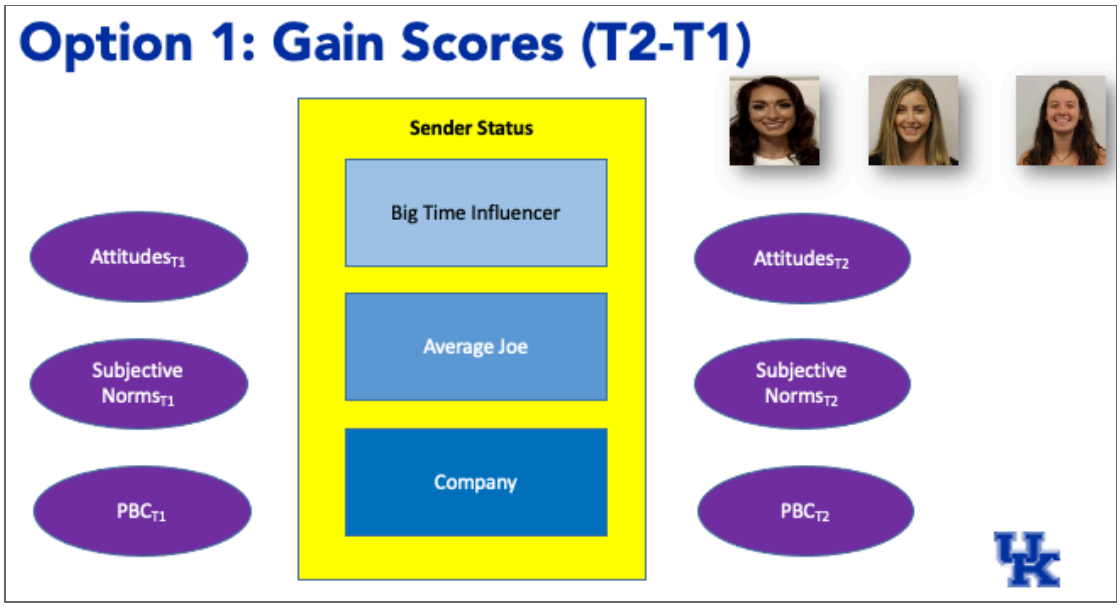
What Test is Appropriate!

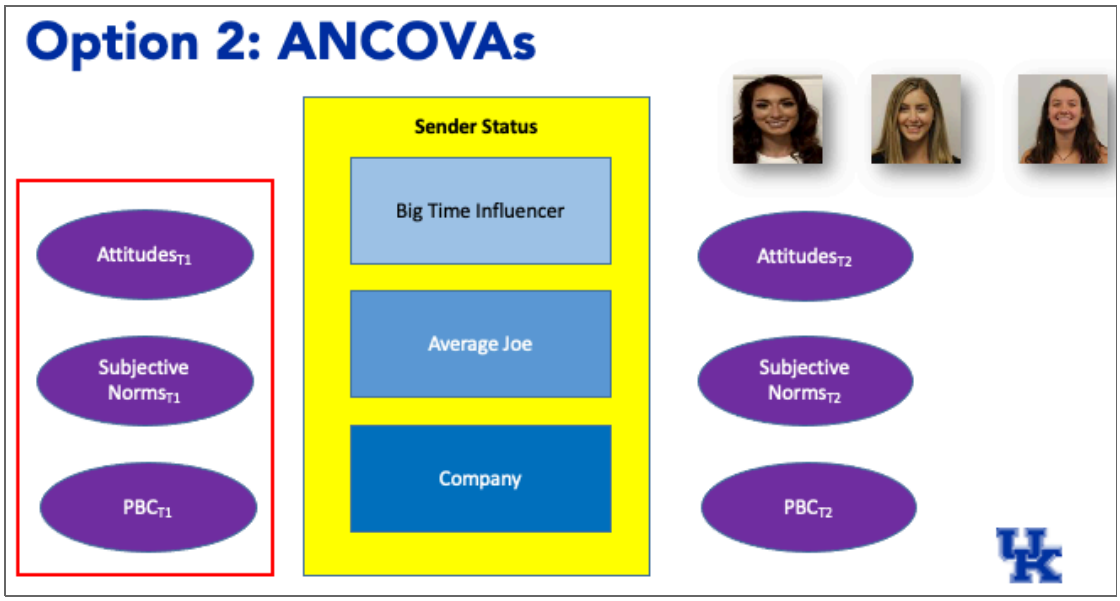
- 1 within subjects IV (2 levels), 1 normally-distributed DV
  - EX: Do students have more research methods knowledge at the end of 665 compared to the beginning?
- 1 within subjects IV (4 levels), 1 normally-distributed DV
  - EX: How does research method knowledge change from January to April (4 months)?
- A 2 x 3 x 2 mixed design with repeated measures on the third variable, 1 normally-distributed DV
  - EX: Do gender and class time
- 1 between groups IV (4 levels), 3 normally-distributed DVs

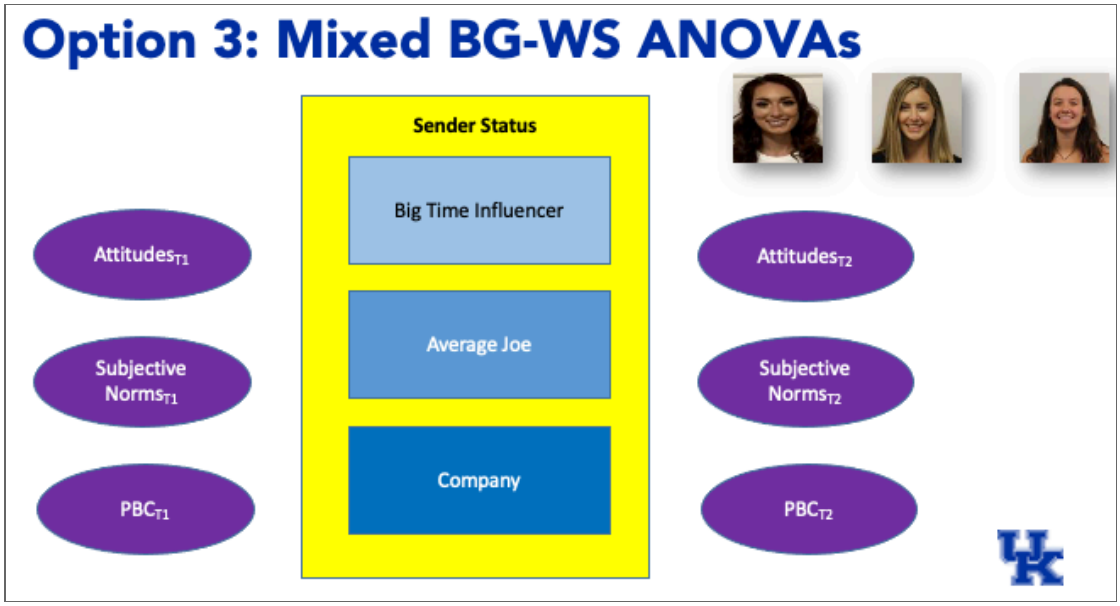
Example Study 1

Overview | Option 1 | Option 2 | Option 3

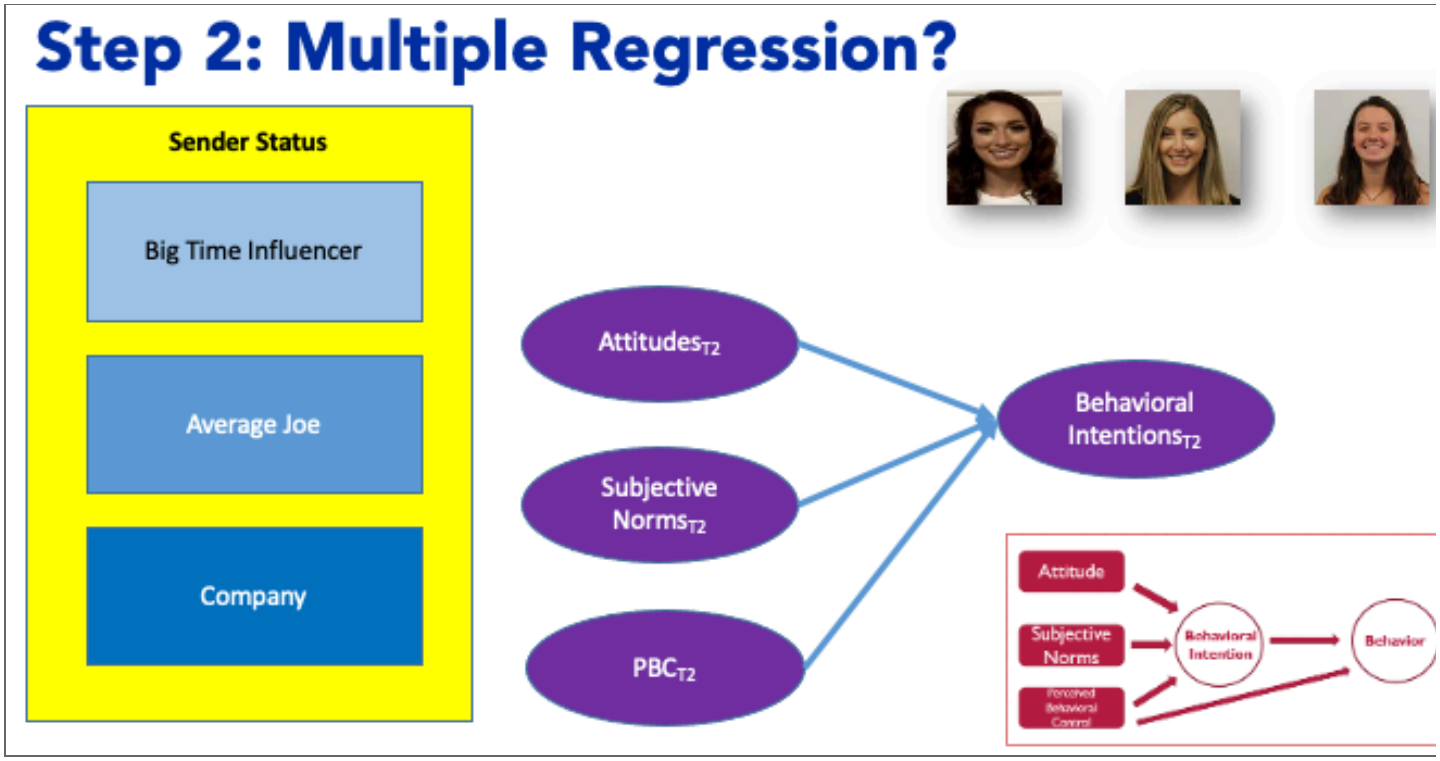





Option 2: ANCOVAs
Sender Status
Big Time Influencer
Average Joe
Company
Attitudes$_{T1}$
Subjective Norms$_{T1}$
PBC$_{T1}$
Attitudes$_{T2}$
Subjective Norms$_{T2}$
PBC$_{T2}$

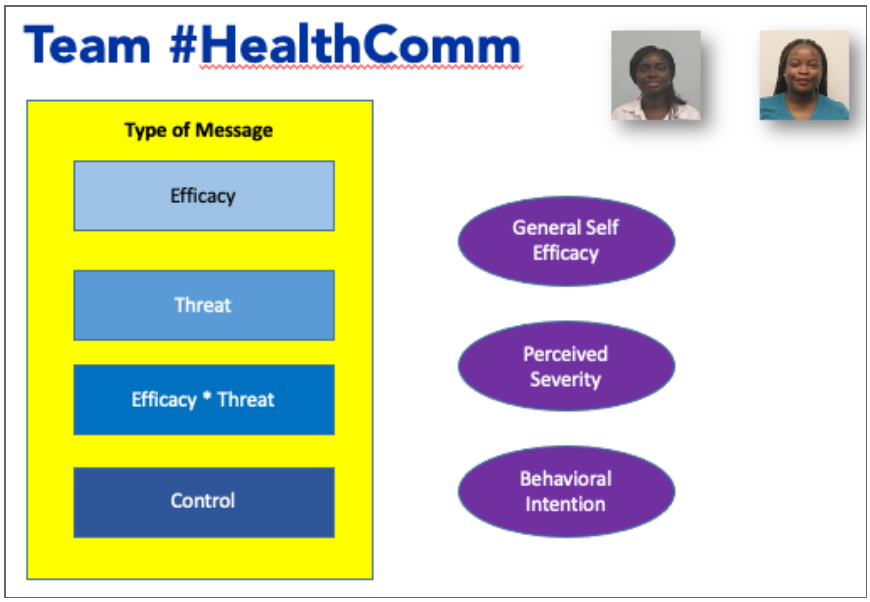

Option 3: Mixed BG-WS ANOVAs
Sender Status
Big Time Influencer
Average Joe
Company
Attitudes$_{T1}$
Subjective Norms$_{T1}$
PBC$_{T1}$
Attitudes$_{T2}$
Subjective Norms$_{T2}$
PBC$_{T2}$

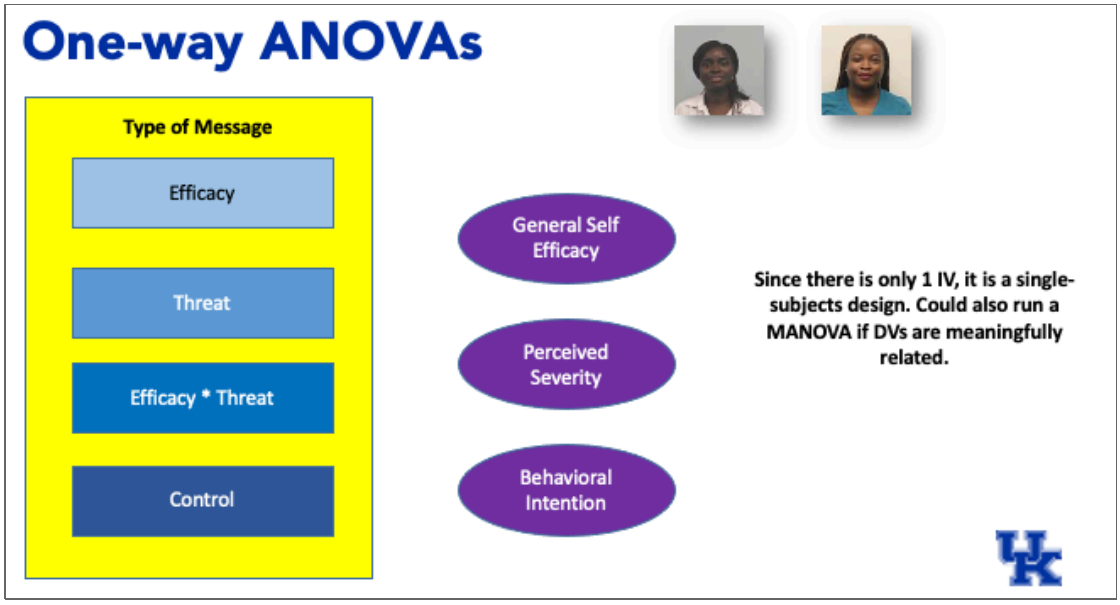
After That?


Step 2: Multiple Regression?
Sender Status
Big Time Influencer
Average Joe
Company
Attitudes$_{T2}$
Subjective Norms$_{T2}$
PBC$_{T2}$
Behavioral Intentions$_{T2}$
Attitude
Subjective Norms
Behavioral Intention
Behavior

Example Study 2

Overview | Test?





GLM Ch. 21 & (Parts of) 22

21: *Analysis and Interpretation of Basic Associational Research Questions*
22: *Analysis and Interpretation of Complex Associational Questions*

Ch. 21 Overview

Chapter 21 (p. 369-385) covers:

- Analyzing Continuous Variables with Parametric Statistics
  - Pearson Product-Moment Correlation (r)
  - Statistical Significance
  - Correlation Matrix
  - Effect Sizes
  - Confidence Intervals
- Using Nonparametric Associational Statistics
  - Spearman Rank-Order Correlation Coefficient (rho)
  - Kendall Tau Coefficient (tau)
  - Misleading Correlation Coefficients (p. 374-376)
  - Associational Statistics for Nominal Variables
  - The Chi-Square Test and Effect Size Indices

Remember Pearson

What are correlations?

An index of the strength of the linear relationship between two variables

- Ranges from -1 to +1
- A positive relationship means that as scores on one variable increase, scores on the other variable also increase.
- An inverse relationship means that a high score on one variable is associated with a low score for the same person on the other variable and vice versa.

Correlation Matrix

Table 1 Means Table

Measure	*M*	*SD*	Reliability	Range
Caring				
Teacher Self-Report	35.02	4.76	.86	6–42
Perceptions of Supervisor	24.15	9.81	.94	6–42
Burnout				
Emotional Exhaustion	21.50	7.70	.88	9–45
Depersonalization	10.92	4.02	.73	5–25
Loss of Personal Accomplishment	15.13	4.77	.81	7–35
Temperament				
Extraversion	29.92	6.51	.81	6–42
Agreeableness	42.87	8.05	.87	8–56
Conscientiousness	49.17	6.00	.86	8–56
Neuroticism	22.67	7.83	.81	7–49
Openness to Experience	39.96	7.79	.81	8–56
Organizational Outcomes				
Teacher Motivation	23.41	3.64	.92	4–28
Teacher Job Satisfaction	28.07	6.91	.96	5–35

Table 2 Correlations Among Caring, Burnout, and Organizational Variables

	2	3	4	5	6	7
1. Caring (self-report)	−.39	−.56	−.26	.19*	.30	.04*
2. Emotional Exhaustion	–	−.76	−.39	−.16*	−.67	−.50
3. Depersonalization	–	–	.42	−.11*	−.61	−.33
4. Loss of Personal Accomplishment	–	–		−.07*	−.15	−.18*
5. Supervisor Caring	–	–	–	–	.17*	.38
6. Teacher Motivation	–	–	–	–	–	.64
7. Job Satisfaction	–	–	–	–	–	–

Note: All correlations are significant at the .05 level (at least) unless specified.
*Not statistically significant.

Teven, J.J. (2007). Teacher temperament: Correlates with teacher caring, burnout, and organizational outcomes. *Communication Education, 56*, 382-400.

Correlation Matrix

Table 12

Means, Standard Deviations, and Zero-Order Correlations for Variables in Phase 2 for the Full Sample (N = 803)

Variable	Full Sample *M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Mastery Experience	4.4	1.1																	
2. Vicarious Experience	3.9	1.2	.51**																
3. Social Persuasions	3.7	1.3	.73**	.61**															
4. Physiological State	2.6	1.3	-.63**	-.39**	-.51**														
5. Math Grade SE	4.9	1.0	.77**	.44**	.61**	-.55**													
6. Math Skills SE	80.8	15.3	.62**	.43**	.52**	-.44**	.62**												
7. Math Courses SE	3.4	1.5	.48**	.32**	.44**	-.35**	.46**	.51**											
8. Self-Regulatory SE	4.4	1.1	.62**	.63**	.58**	-.57**	.60**	.57**	.42**										
9. Self-Concept	4.4	1.0	.88**	.54**	.73**	-.65**	.73**	.62**	.49**	.65**									
10. Inviting Self	4.3	1.1	.56**	.62**	.59**	-.47**	.56**	.49**	.35**	.72**	.58**								
11. Inviting Others	4.5	1.0	.31**	.46**	.38**	-.28**	.34**	.33**	.22**	.51**	.32**	.60**							
12. Task Goals	3.9	1.2	.44**	.72**	.52**	-.43**	.41**	.39**	.28**	.63**	.48**	.61**	.46**						
13. Approach Goals	4.2	1.2	.12**	.34**	.20**	.02	.08*	.19**	.10*	.15**	.13**	.18**	.15**	.24**					
14. Avoidance Goals	3.1	1.2	-.23**	.04	-.11*	.37**	-.23**	-.16**	-.13**	-.18**	-.22**	-.10*	-.03	-.02	.45**				
15. Self-Handicapping	2.6	1.2	-.28**	-.18**	-.16**	.31**	-.25**	-.23**	-.20**	-.32**	-.28**	-.21**	-.22**	-.18**	.00	.25**			
16. Optimism	4.2	0.9	.48**	.46**	.47**	-.46**	.45**	.43**	.31**	.53**	.49**	.53**	.37**	.48**	.06	-.25**	-.23**		
17. Teacher Rating	7.3	1.9	.46**	.06	.31**	-.28**	.42**	.44**	.30**	.21**	.42**	.14**	.16**	.05	.04	-.24**	-.20**	.19**	
18. Semester GPA	85.4	8.2	.63**	.16**	.40**	-.34**	.59**	.45**	.33**	.33**	.56**	.26**	.24**	.14**	.01	-.23**	-.28**	.26**	.69**

Note. For calculations with Semester GPA, $N = 784$. SE = self-efficacy.
* $p < .05$. ** $p < .001$.

Usher, E. L. (2007). Tracing the origins of confidence: A mixed methods exploration of the sources of self-efficacy beliefs in mathematics (Unpublished doctoral dissertation). Emory University, Atlanta, GA.

Correlation Matrix

Table 13

Means, Standard Deviations, and Zero-Order Correlations for Variables in Phase 2 by Gender

		Girls																			Boys	
Variable		*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	*M*	*SD*
1.	Mastery Experience	4.3	1.2		.51**	.71**	-.61**	.78**	.64**	.48**	.59**	.88**	.58**	.34**	.45**	.20**	-.13*	-.27**	.55**	.39**	.57**	4.4	1.1
2.	Vicarious Experience	3.9	1.2	.53**		.64**	-.38**	.42**	.43**	.27**	.58**	.54**	.62**	.48**	.72**	.37**	.11*	-.15*	.50**	.03	.16*	3.9	1.2
3.	Social Persuasions	3.7	1.3	.75**	.58**		-.47**	.58**	.50**	.41**	.56**	.72**	.61**	.42**	.55**	.28**	.00	-.13*	.50**	.23**	.35**	3.8	1.3
4.	Physiological State	2.7	1.3	-.65**	-.40**	-.54**		-.50**	-.41**	-.30**	-.51**	-.62**	-.46**	-.29**	-.43**	-.08	.29**	.30**	-.46**	-.17**	-.28**	2.5	1.2
5.	Math Grade SE	4.9	1.0	.76**	.46**	.64**	-.59**		.65**	.47**	.58**	.75**	.57**	.36**	.39**	.12*	-.17**	-.22**	.48**	.39**	.58**	4.9	1.0
6.	Math Skills SE	79.4	15.8	.61**	.43**	.54**	-.46**	.60**		.51**	.55**	.64**	.51**	.35**	.39**	.25**	-.09	-.19**	.43**	.47**	.50**	82.2	14.6
7.	Math Courses SE	3.4	1.5	.48**	.37**	.47**	-.40**	.45**	.51**		.38**	.47**	.35**	.24**	.25**	.10*	-.13*	-.23**	.28**	.32**	.32**	3.4	1.4
8.	Self-Regulatory SE	4.5	1.1	.65**	.68**	.60**	-.62**	.63**	.61**	.47**		.62**	.72**	.54**	.58**	.24**	-.06	-.30**	.50**	.20**	.33**	4.4	1.0
9.	Self-Concept	4.4	1.1	.88**	.54**	.74**	-.67**	.72**	.59**	.50**	.69**		.62**	.36**	.50**	.23**	-.10	-.27**	.55**	.37**	.52**	4.5	1.0
10.	Inviting Self	4.4	1.1	.54**	.62**	.58**	-.50**	.56**	.49**	.36**	.71**	.56**		.65**	.58**	.22**	.03	-.14*	.54**	.13*	.29**	4.3	1.1
11.	Inviting Others	4.7	0.9	.33**	.45**	.36**	-.30**	.33**	.35**	.22**	.47**	.30**	.55**		.46**	.18**	.02	-.18**	.37**	.14*	.23**	4.3	1.1
12.	Task Goals	3.9	1.2	.45**	.72**	.51**	-.45**	.43**	.40**	.32**	.69**	.48**	.64**	.45**		.29**	.08	-.11*	.51**	.02	.14*	3.8	1.3
13.	Approach Goals	4.1	1.2	.05	.32**	.13*	.11*	.04	.12*	.10*	.09	.03	.16*	.15*	.19**		.45**	.01	.12*	.05	.08	4.3	1.1
14.	Avoidance Goals	3.0	1.2	-.33**	-.04	-.22**	.44**	-.28**	-.24**	-.13*	-.28**	-.34**	-.21**	-.07	-.13**	.44**		.28**	-.18**	-.24**	-.17*	3.1	1.2
15.	Self-Handicapping	2.5	1.2	-.30**	-.22**	-.19**	.33**	-.27**	-.29**	-.18**	-.34**	-.31**	-.27**	-.25**	-.25**	-.02	.22**		-.21*	-.20**	-.26**	2.7	1.2
16.	Optimism	4.3	0.9	.43**	.42**	.45**	-.48**	.43**	.45**	.34**	.56**	.45**	.52**	.36**	.45**	.02	-.31**	-.24**		.16*	.27**	4.2	0.9
17.	Teacher Rating	7.3	1.9	.52**	.09	.38**	-.37**	.45**	.41**	.29**	.23**	.45**	.14*	.18**	.09	.02	-.25**	-.21**	.23*		.67**	7.4	1.9
18.	Semester GPA	86.0	8.3	.69**	.17**	.46**	-.41**	.60**	.42**	.34**	.33**	.61**	.23**	.24**	.14*	-.05	-.28**	-.29**	.24**	.72**		84.8	8.1

Note . Correlations for the girls ($n = 408$) appear below the diagonal; correlations for boys students ($n = 395$) appear above the diagonal. For calculations with Semester GPA, n for Girls = 398, n for Boys = 384. SE = self-efficacy.
* $p < .05$. ** $p < .001$.

Ch. 22 Overview

- Use and Interpretation of Multiple Regression
  - Correlation and Bivariate Regression
  - Conditions and Assumptions
  - Computing Multiple Regression (partial correlations)
  - **Hierarchical Multiple Regression**
  - **Simultaneous Multiple Regression**
  - **Stepwise Multiple Regression**
  - Logistic Regression
  - Discriminant Analysis

What is Regression?

In linear regression, the regression coefficient represents the amount of change in the dependent variable for one-unit change in the independent variable.

Defining Types of Regression

TABLE 22.5
Types of Regressions and Their Description

Type of regression	Description
Bivariate regression	Regression analysis where one continuous variable predicts another continuous variable.
Multiple regression	A statistical method for analyzing data when there are several continuous and/or dichotomous independent variables and one continuous dependent variable.
Hierarchical regression	A type of multiple regression that shows how variable(s)/ predictor(s) entered in a specific order improves the prediction.
Stepwise regression	A procedure that is similar to hierarchical multiple regression, but the computer instead of the researcher decides the order and how many of the potential predictors are used. The stepwise regression procedure describes how much more each independent or predictor variable has contributed to the prediction from the predictor variables already used.
Mediation	A type of regression analysis where a variable (i.e., the mediating variable) reduces the magnitude of the relationship between two other variables.
Moderation	A type of regression analysis when the relationship between two variables is different depending on the level of a third variable.
Logistic regression	A type of regression analysis where a categorical outcome variable is something that is predicted to happen or not.
Discriminant analysis	When there are several continuous predictor variables and a categorical outcome variable and when the goal is to categorize individuals or cases into categories.

Conducting the Tests in SPSS

Correlation

Overview | Focus | Steps | Alternative? | SPSS

Also known as Pearson's Product Moment or Pearson's *r*
Assess relationship between *two continuous variables*
Variable 1: Total Perceived Stress (tpstress)
Variable 2: Total Perceived Control of Internal States (tpcoiss)

- Check for Outliers
- Inspect distribution of data points
- Determine direction of relationship
- Determine strength of relationship

The nonparametric* alternative is Spearman's rho
*Inferential statistics that are used when the data do not meet the assumption of normality.

Procedure for requesting Pearson *r* or Spearman *rho*

1. From the menu at the top of the screen, click on **Analyze,** then select **Correlate,** then **Bivariate.**
2. Select your two variables and move them into the box marked **Variables** (e.g. Total perceived stress: tpstress, Total PCOISS: tpcoiss). If you wish you can list a whole range of variables here, not just two. In the resulting matrix, the correlation between all possible pairs of variables will be listed. This can be quite large if you list more than just a few variables.
3. In the **Correlation Coefficients** section, the **Pearson** box is the default option. If you wish to request the **Spearman *rho*** (the non-parametric alternative), tick the **Spearman** box instead (or as well).
4. Click on the **Options** button. For **Missing Values,** click on the **Exclude cases pairwise** box. Under **Options,** you can also obtain means and standard deviations if you wish
5. Click on **Continue** and then on **OK** (or on **Paste** to save to **Syntax Editor**).

Understanding the Output

Effect Sizes for r

- Small *r* = .10 to .29
- Medium *r* = .30 to .49
- Large *r* = .50 to 1.00

Cohen (1988, pp. 79-81)

Writing it Up

Partial Correlation

Overview | Focus | Steps | SPSS

A measure of the relationship between the independent variable and the criterion variable, keeping the other independent variables constant.
TL;DR: It has a control.
Variable 1: Total Perceived Stress (tpstress)
Variable 2: Total Perceived Control of Internal States (tpcoiss)
Control: Total Social Desirability (tmarlow)

- Check assumptions (normality, linearity, homoscedasticity)
- Inspect distribution of data points
- Determine direction of relationship
- Determine strength of relationship

1. From the menu at the top of the screen, click on **Analyze,**then select **Correlate,**then **Partial.**
2. Click on the two continuous variables that you want to correlate (e.g. Total PCOISS: tpcoiss, Total perceived stress: tpstress). Click on the arrow to move these into the **Variables**box.
3. Click on the variable that you wish to control for (e.g. Total social desirability: tmarlow) and move it into the **Controlling for**box.
4. Click on **Options.**

   ➢ In the Missing Values section, click on Exclude cases pairwise.
   ➢ In the Statistics section, click on Zero order correlations.

5. Click on **Continue**and then **OK**(or on **Paste**to save to **Syntax Editor).**

Understanding the Output

Effect Sizes

- Small r = .10 to .29
- Medium r = .30 to .49
- Large r = .50 to 1.00

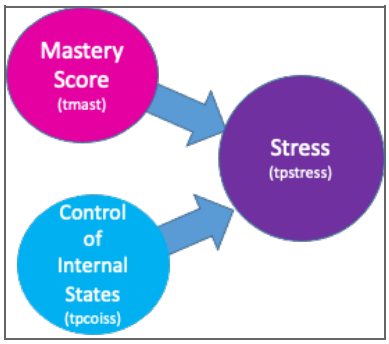
Cohen (1988, pp. 79-81)

Writing it Up

Multiple Regression

Overview | Focus | Assumptions | SPSS

Includes several continuous and/or dichotomous IVs and one continuous DV
H1: How well do the two measures of control (mastery, PCOISS) predict perceived stress?
H2: Which is the best predictor of perceived stess: control of external events (mastery scale) or control of internal states (PCOISS)?



- DV should be at least interval (normally distributed)
  - IVs tend to be as well, but you can have dichotomous IVs. These are called dummy variables
- Must check for *Multicollinearity*
  - Occurs when there are high intercorrelations among some set of predictors
  - Two or more predictors contain much of the same information
- IVs are related to DVs in linear fashion
  - Straight line
  - Not curvilinear
- IVs should be correlated with the DVs, but not highly

Procedure for standard multiple regression

1. From the menu at the top of the screen, click on Analyze, then select **Regression,**then **Linear.**
2. Click on your continuous, dependent variable (e.g. Total perceived stress: tpstress) and move it into the **Dependent**box.
3. Click on your independent variables (Total Mastery: trnast, Total PCOISS: tpcoiss) and click on the arrow to move them into the **Independent(s)**box.
4. For **Method,**make sure **Enteris** selected. (This will give you standard multiple regression.)
5. Click on the **Statistics**button.

   ➢ Select the following: Estimates, Confidence Intervals, Model fit, Descriptives, Part and partial correlations and Collinearity diagnostics.
   ➢ In the Residuals section, select Casewise diagnostics and Outliers outside 3 standard deviations. Click on Continue.

6. Click on the **Options**button. **In**the **Missing Values**section, select **Exclude cases pairwise.**Click on **Continue**
7. Click on the **Plots**button.

   ➢ Click on *ZRESID and the arrow button to move this into the Y box.
   ➢ Click on *ZPRED and the arrow button to move this into the X box.
   ➢ In the section headed Standardized Residual Plots, tick the Normal probability plot option. Click on Continue.

8. Click on the **Save**button

   ➢ In the section labelled Distances, select Mahalanobis box and Cook's.
   ➢ Click on Continue and then OK (or on Paste to save to Syntax Editor).

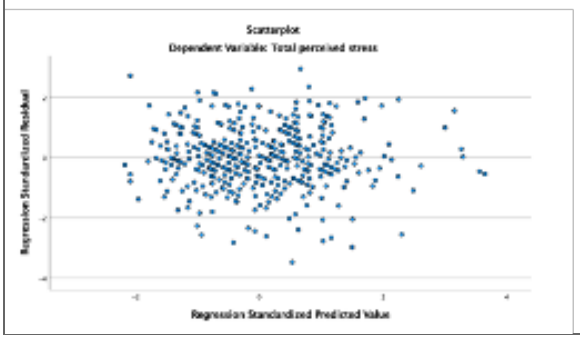
Checking MR Assumptions

Multicollinearity | **Normality** | **Multivariate Outliers**

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	95.0% Confidence Interval for B Lower Bound	95.0% Confidence Interval for B Upper Bound	Correlations Zero-order	Correlations Partial	Correlations Part	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	50.971	1.273		40.035	<.001	48.469	53.474					
	tmast Total Mastery	-.625	.061	-.424	-10.222	<.001	-.745	-.505	-.612	-.445	-.362	.729	1.372
	tpcoiss Total PCOISS	-.175	.020	-.360	-8.660	<.001	-.215	-.136	-.581	-.388	-.307	.729	1.372

[a] Dependent Variable: tpstress Total perceived stress



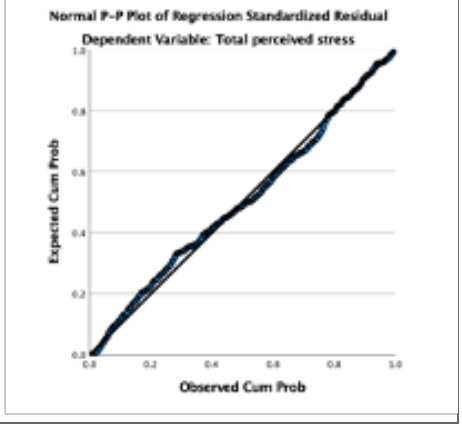


Table 13.1 Critical values for evaluating Mahalanobis distance values

Number of indep. variables	Critical value	Number of indep. variables	Critical value	Number of indep. variables	Critical value
2	13.82	4	18.47	6	22.46
3	16.27	5	20.52	7	24.32

Source: Extracted and adapted from a table in Tabachnick and Fidell (2013); originally from Pearson, E.S. & Hartley, H.O. (eds) (1958). ***Biometrika tables for statisticians*** (2nd edn, vol. 1). New York: Cambridge University Press.

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	18.03	41.31	26.74	4.001	429
Std. Predicted Value	-2.174	3.644	.002	1.000	429
Standard Error of Predicted Value	.207	.800	.341	.111	429
Adjusted Predicted Value	18.04	41.39	26.75	4.009	426
Residual	-14.849	12.612	-.002	4.268	426
Std. Residual	-3.475	2.951	.000	.999	426
Stud. Residual	-3.514	2.969	.000	1.003	426
Deleted Residual	-15.190	12.765	-.001	4.306	426
Stud. Deleted Residual	-3.582	2.997	.000	1.006	426
Mahal. Distance	.004	13.897	1.993	2.234	429
Centered Leverage Value	.000	.033	.005	.005	429

[a] Dependent Variable: tpstress Total perceived stress

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REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING PAIRWISE
  /STATISTICS COEFF OUTS CI(95) R ANOVA COLLIN TOL ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT tpstress
  /METHOD=ENTER tmast tpcoiss
  /SCATTERPLOT=(*ZRESID ,*ZPRED)
  /RESIDUALS NORMPROB(ZRESID)
  /CASEWISE PLOT(ZRESID) OUTLIERS(3)
  /SAVE MAHAL COOK.
```

Interpreting the Outpet

Unstandardized Interpretation

For every 1 unit increase in mastery, perceived stress decreases by -.63 points

Standardized Interpretation

For every 1 standard deviation increase in mastery, perceived stress decreases by -.42 standard deviation.

Mediation & Moderation

Other Forms of Regression

Logistic Regression | **Hierarchical Multiple Regression** | **Stepwise Multiple Regression**

A categorical outcome variable is something that is predicted to happen or not.
Based largely in probability, as the outcome is dichotomous.
Variables are entered in steps, and the CHANGE in R2 is examined at each
The order is decided ahead of time
Are there things that need to be controlled? Enter these first!
The computer instead of the researcher decides the order and how many of the predictors are used.
Describes how much more each IV has contributed to the prediction from the predictors already used.

Another Knowledge Check!

Summary and Review

- Changing up next week to give more hands on analysis
- Example write ups and tables in Canvas
- There are too many types of regression
- Still cannot say ‘predict’ unless design is experimental
- Theory is still driving choices

Workshop: Connecting Surveys to CI SONA

Broad Steps

- Finish surveys
- Double check them
- Complete **research subjects request form**
- Get IRB approval and retain approval number
- Add survey to SONA

Embedd ID

For Qualtrics:

- MUST add embed data to survey flow

Setting up CI SONA

Selecting the Type of Study

Adding the tag

Redirecting

After SONA generates your unique URL, you must add this back to Qualtrics so that participants are redirected.

Scott Johnson

Add Scott Johnson (scott.johnson@uky.edu) as a collaborator.
He is the resident Qualtrics guru and keeper of the SONA.

Error ×