

Statistics One

Lecture 11 Moderation

Three segments

- Moderation Example 1
- Details: Centering and dummy coding
- Moderation Example 2

Lecture 11

Segment 1

Moderation Example 1

Mediation & Moderation

- Mediation and moderation may sounds alike but they are quite different
 - Mediation (Lecture 10)
 - Moderation (Lecture 11)
 - Both demonstrated in R (Lecture 12)

Mediation



Moderation



Mediation & Moderation

- KISS! Keep It Simple Stupid!
- Only 4 variables!
 - X: Predictor variable (could be an IV)
 - Y: Outcome variable (could be a DV)
 - M: Mediator variable
 - Z: Moderator variable

An example

- X: Psychological trait
 - Extraversion
- Y: Behavioral outcome
 - Happiness
- M: Mechanism
 - Diversity of life experience
- Z: Moderator (ZAP! or ZING!)
 - Socio-Economic-Status (SES)

Moderation

- Let's just look at X, Y, and Z
 - X: Extraversion
 - Y: Happiness
 - Z: SES

Moderation

- A moderator variable (Z) has influence over the relationship between X and Y
 - For example, suppose X and Y are positively correlated
 - The moderator (Z) can change that (ZAP, ZING)

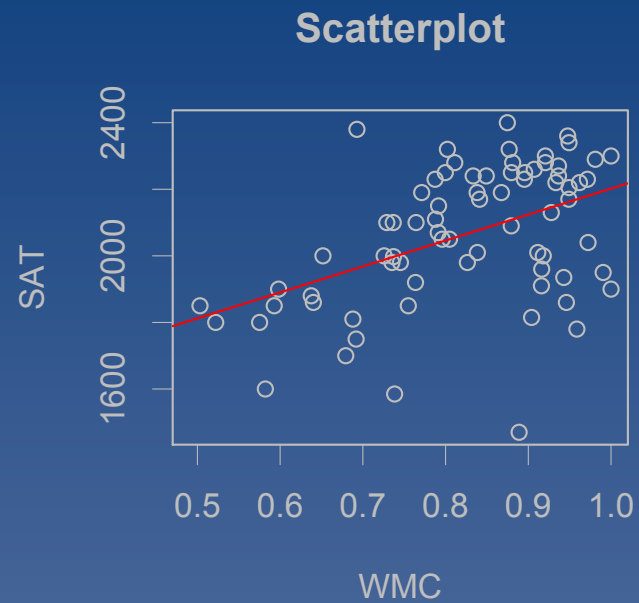
Moderation

- If X and Y are correlated then we can use regression to predict Y from X
 - $Y = B_0 + B_1X + e$
 - **CAUTION!**
 - If there is a moderator, Z , then B_1 will depend on Z
 - The relationship between X and Y changes as a function of Z

Moderation

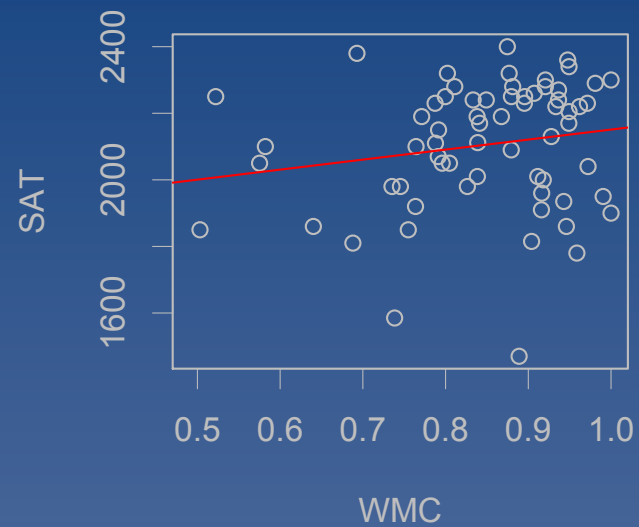
- Quick example:
 - Working memory capacity (X)
 - SAT (Y)
 - Type of University (Z)
 - » Large Public State University
 - » Ivy League (ZAP!)

Public University



Ivy League

Scatterplot



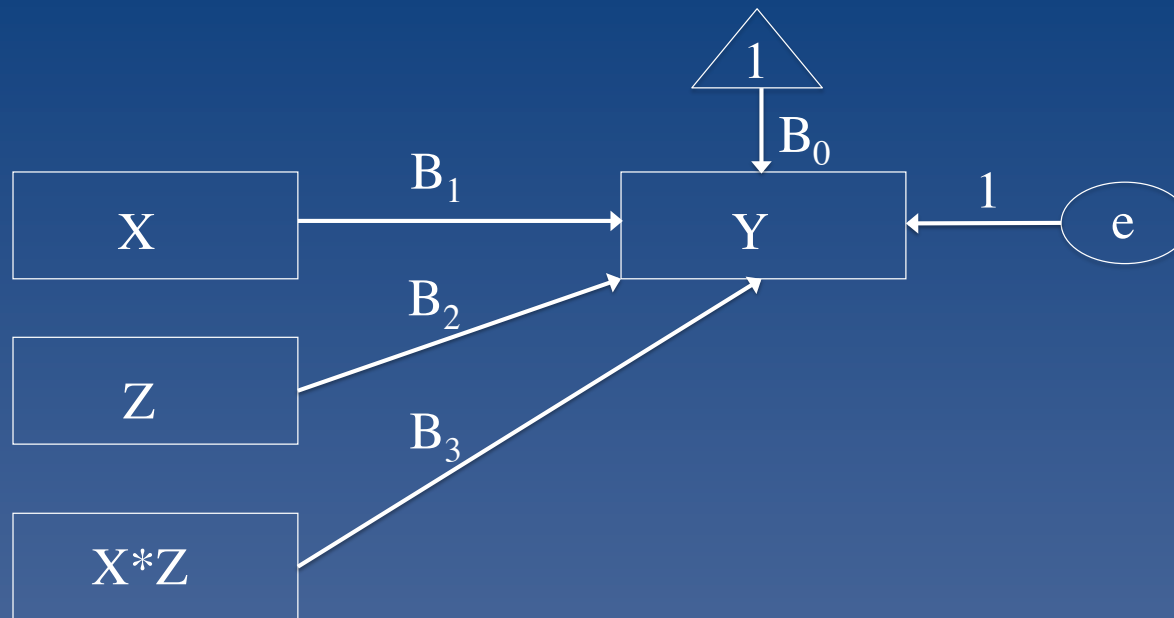
Interpretation

- Type of University moderates the relationship between WMC and SAT

Moderation model

- $Y = B_0 + B_1X + B_2Z + B_3(X*Z) + e$

Moderation model



How to test for moderation

- Run just one regression model
 - $\text{lm}(Y \sim X + Z + X*Z)$
 - » Need to create new column for $(X*Z)$
 - » Let's call it PRODUCT

Back to the example

- X: Psychological trait
 - Extraversion
- Y: Behavioral outcome
 - Happiness
- Z: Moderator (ZAP! or ZING!)
 - Socio-Economic-Status (SES)

Fictive data

- Assume $N = 188$
- Participants surveyed and asked to report:
 - Happiness (happy)
 - Extraversion (extra)
 - Diversity of life experiences (diverse)
- Assume all are scored on a scale from 1 - 5

Fictive data

- To simplify, let's make SES categorical
 - $\text{SES} = 1 = \text{HIGH SES}$
 - $\text{SES} = 0 = \text{LOW SES}$

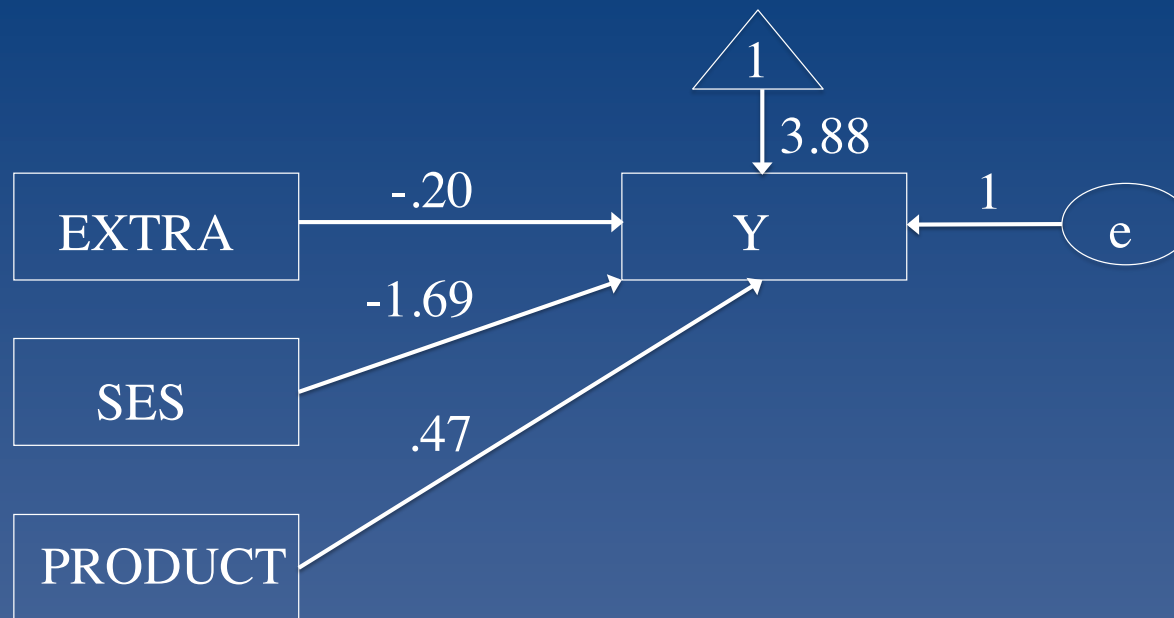
Results: Before adding PRODUCT

- $\hat{Y} = B_0(1) + B_1(\text{EXTRA}) + B_2(\text{SES})$
- $\hat{Y} = 3.04 + .039 (\text{EXTRA}) + 0.00(\text{SES})$

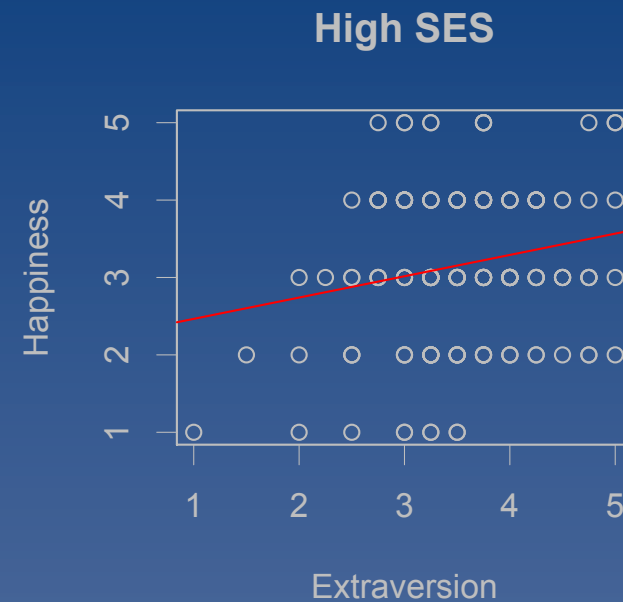
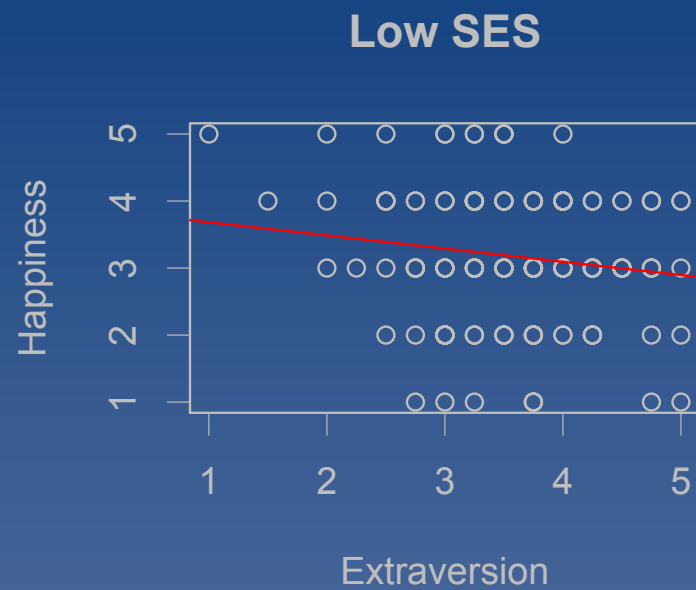
Results: After adding PRODUCT

- $\hat{Y} = B_0(1) + B_1(\text{EXTRA}) + B_2(\text{SES}) + B_3(\text{PRODUCT})$
- $\hat{Y} = 3.88 + -0.20(\text{EXTRA}) + -1.69(\text{SES}) + 0.47(\text{PRODUCT})$

Moderation model: Results



Moderation model: Results



Interpretation

- SES moderates the relationship between extraversion and happiness
 - Moral of the story:
 - The picture can change, literally, when you consider a new variable

Image in slide 5 was retrieved from
<http://www.valdosta.edu/crc/images/mediation.jpg>

Image in slide 6 was retrieved from
<http://www.perroquet-island.com/journal/wp-content/uploads/equipe.jpg>

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