Mediation and Moderation Workshop

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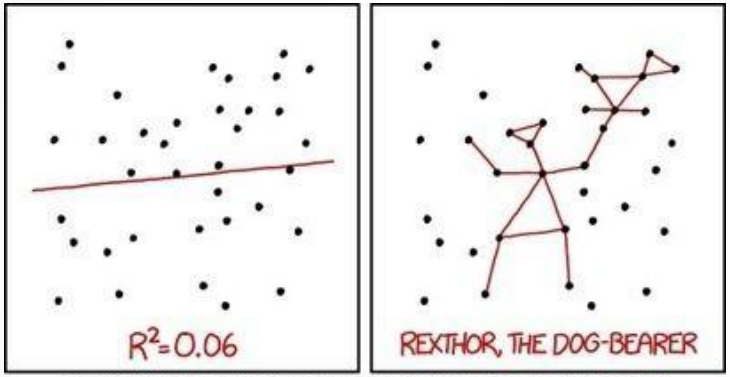
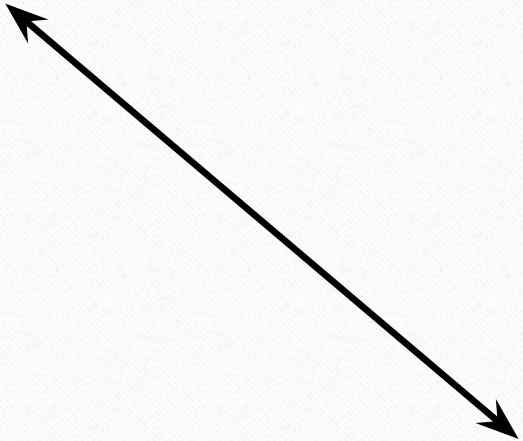
Regression Refresher



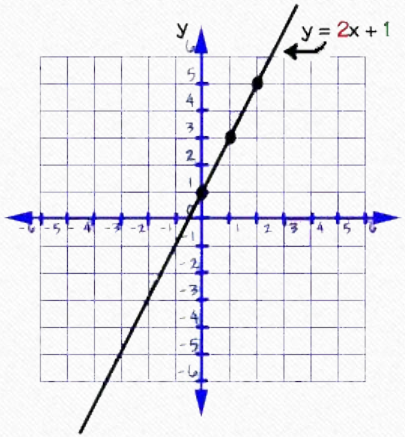
I DON'T TRUST LINEAR REGRESSIONS WHEN IT'S HARDER TO GUESS THE DIRECTION OF THE CORRELATION FROM THE SCATTER PLOT THAN TO FIND NEW CONSTELLATIONS ON IT.

What's this?



Regression: Definition

- Based on the linear model
- Y = mx + b
- Relationship between a predictor variable and an outcome variable

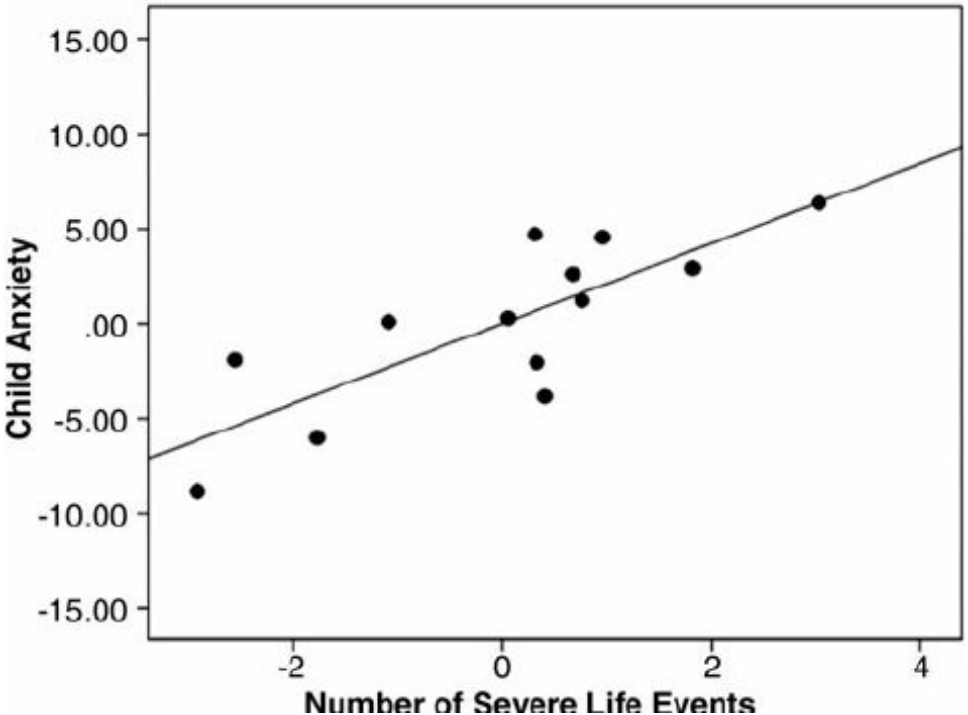


Regression: Example

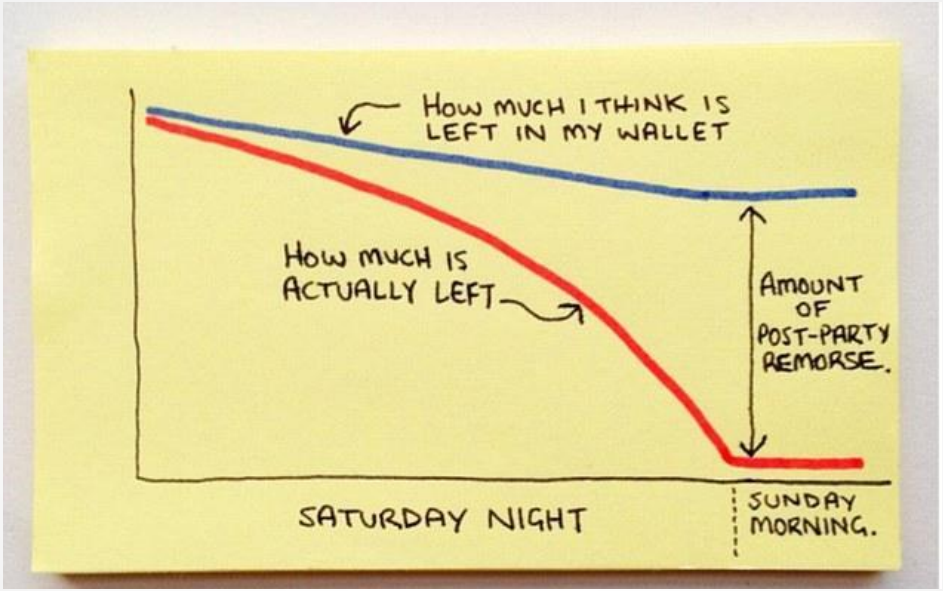
- Research Question: How does the amount of hours spent watching COVID-19 news relate to COVID-19 anxiety?
- Hypothesis: If an individual spends more hours watching COVID-19 related news they are expected to have higher COVID-19 related anxiety
  - Independent variable: Hours spent watching COVID-19 news
  - Dependent variable: Level of COVID-19 anxiety
  - $Y = mx + b$
    - Anxiety = m(hours spent watching COVID-19 news) + anxiety when hours is 0

Regression: Example Figure

- What other variables do you think could affect the relationship between hours spent watching COVID-19 related news and COVID-19 related anxiety?



Moderation


HOW MUCH I THINK IS LEFT IN MY WALLET
HOW MUCH IS ACTUALLY LEFT
AMOUNT OF POST-PARTY REMORSE.
SATURDAY NIGHT
SUNDAY MORNING.

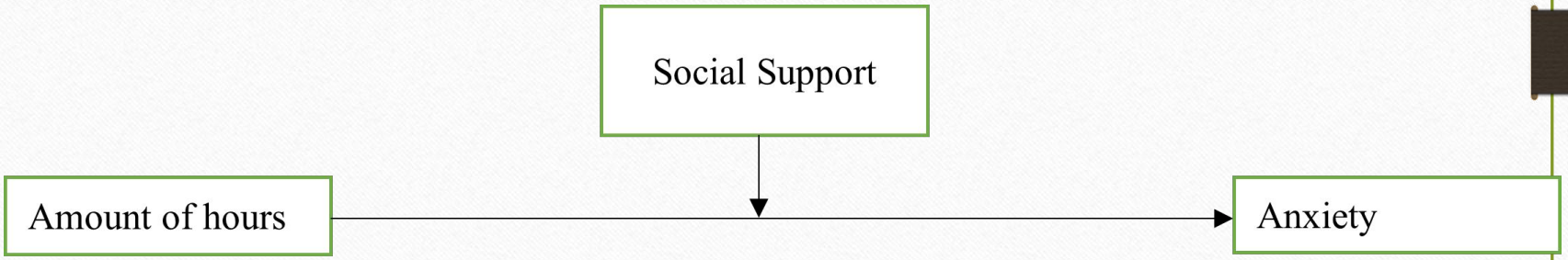
Moderation: Definition

- Moderation = Another way of saying there is an interaction between predictors
  - A moderation effect is a significant interaction
- Although any interaction could be called moderation there are specific circumstances when they are called moderation
  - One of the predictors is the IV of interest
  - The other IV helps describe the relationship
  - Moderator is preexisted and not manipulated (ex. Gender, age)

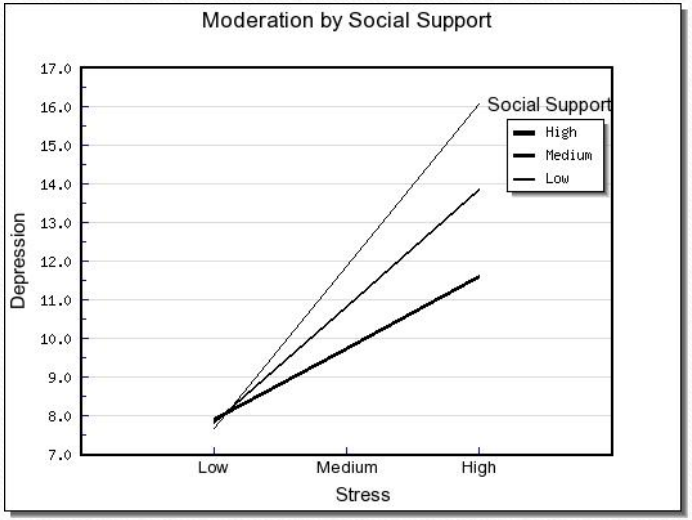
Moderation: Example

- Research Question: Does the relationship between the amount of hours of COVID-19 related news watched and COVID-19 related anxiety depend on the level of social support an individual has?
- Hypothesis: When the amount of hours is high but social support is also high an individual will have less COVID-19 related anxiety
  - Independent variable: Hours spent watching COVID-19 news
  - Moderator: Amount of social support
  - Dependent variable: Level of COVID-19 anxiety
  - Y = m1x1 + m2x2 + x1*x2+ b
    - Anxiety = m(hours spent watching COVID-19 news) + m(amount of social support) + interaction between x and y + anxiety when hours is 0

Moderation: Theoretical Model



Moderation: Example Figure



Mediation


SURE, MEDIATION IS COOL.
BUT MAYBE NEXT TIME WE CAN HANG OUT WITHOUT YOUR FRIEND.

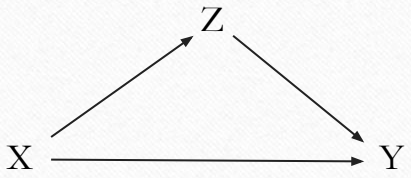
Mediation: Definition

Process analysis

- How the primary relationship works

We can answer

- How x influences z
- How z influences y
- How x influences y through z



Direct, Indirect, and Total Effects

Total effect: relationship between x and y, ignoring other variables (i.e., they are not in the model)

Direct effect: relationship between x and y, holding other predictors constant

- Regression coefficients

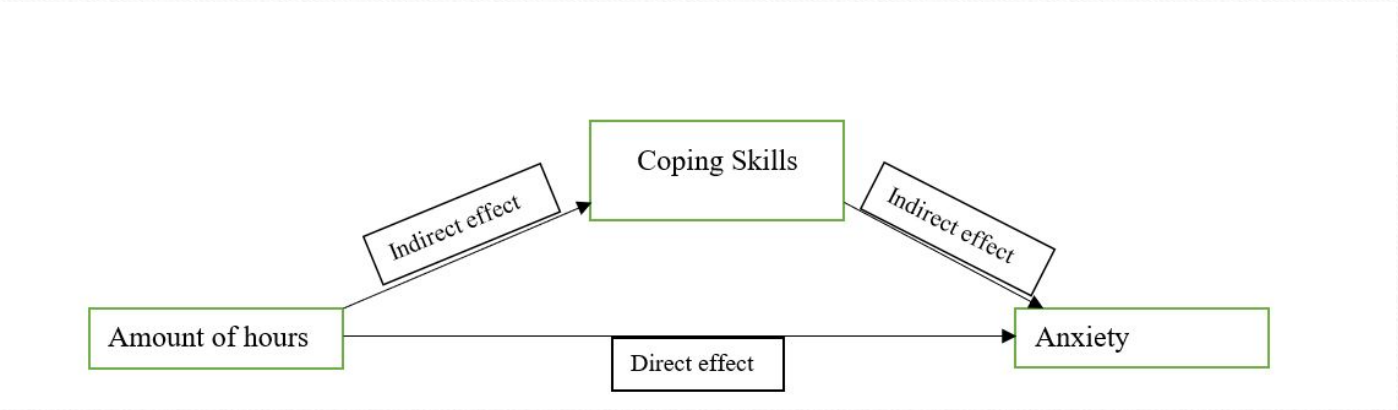
Indirect effect: relationships through our mediator variable (z)

Total effect = direct effect + indirect effect

Mediation Example

- Research Question: Does the amount of hours of COVID-19 related news watched directly influence COVID-19 related anxiety, or is it mediated by number of coping skills used?
- Hypothesis: When the amount of hours is high but number of coping skills used is low, an individual will have more COVID-19 related anxiety
  - Independent variable: Hours spent watching COVID-19 news
  - Mediator: Number of coping skills used
  - Dependent variable: Level of COVID-19 anxiety

Mediation: Theoretical Model



Using PROCESS Macro in SPSS

SPSS as is cannot run a mediation model on its own

Need to download the PROCESS macros written by Andrew Hayes

- www.processmacro.org
- Variable names should be no more than 8 characters in length
- Need to filter out categories that have only one case
- Multicategorical variables need to be identified
- Can't have dichotomous mediators in PROCESS

Bootstrapping

Sampling distributions are rarely normal

Bootstrapping: repeated resampling from original cases

- Derive empirical standard error

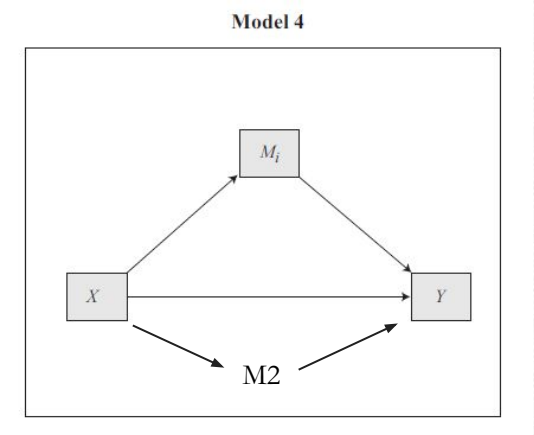
When using bootstrapping - have to look at the confidence intervals

- If the CI doesn't contain zero, it is a significant mediator

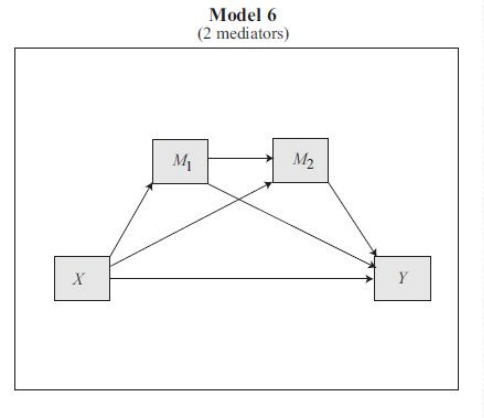
Need at least 5,000; standard is 10,000

Types of Multiple Mediator Models

Parallel Multiple Mediator Model

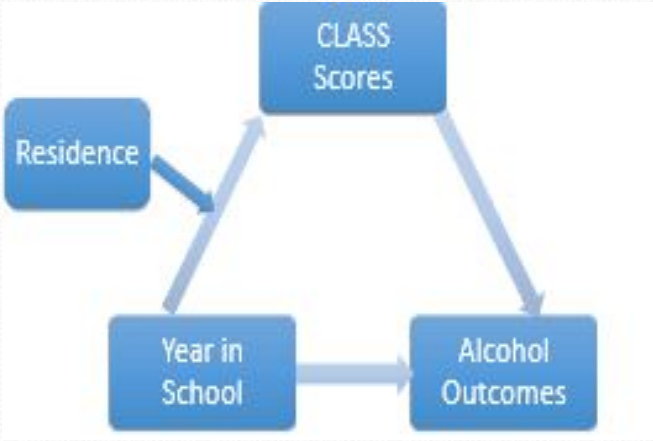


Serial Multiple Mediator Model

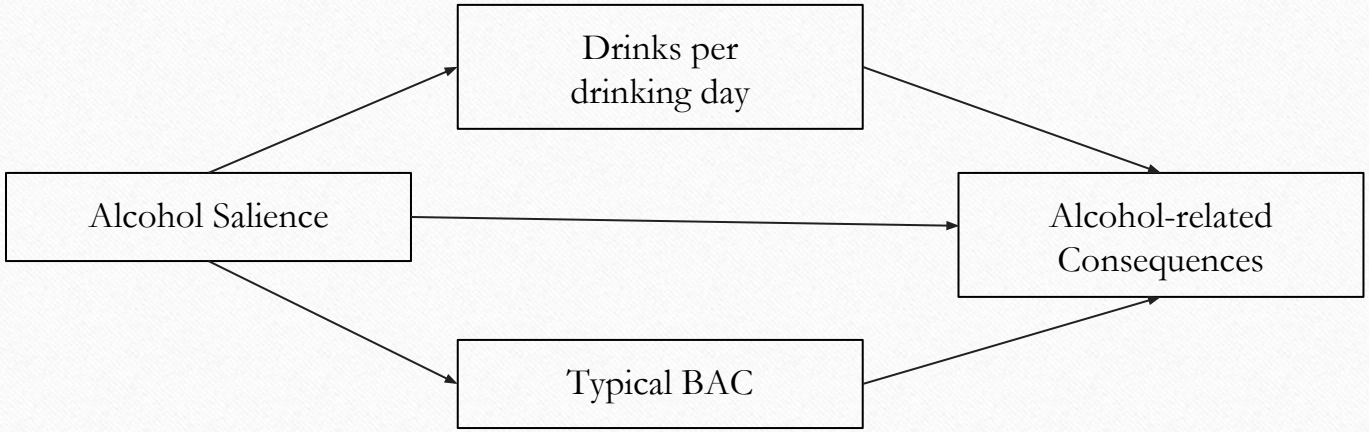


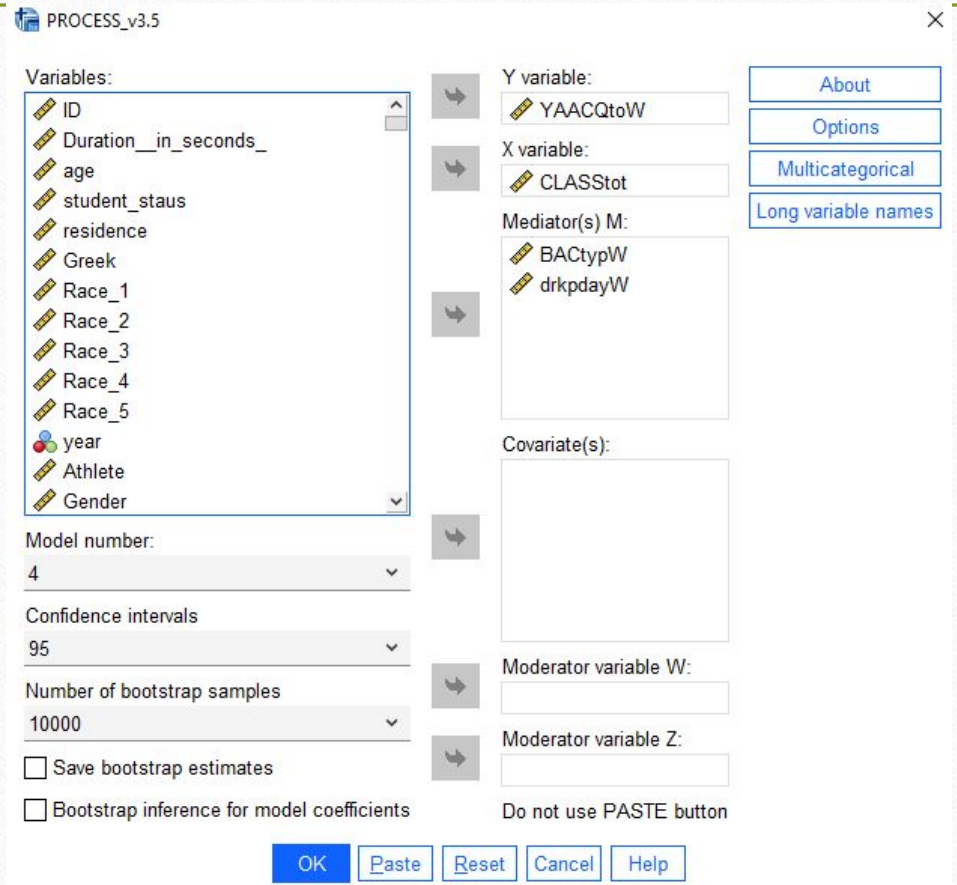
Combining the two: Moderated Mediation Model

Does CABs (CLASS scores) mediate the association between year-in-school and alcohol outcomes, and does residence (on- versus off-campus) moderate the association between year-in-school and CABs?



Example Parallel Mediation




PROCESS_v3.5
Variables:
ID
Duration__in_seconds_
age
student_staus
residence
Greek
Race_1
Race_2
Race_3
Race_4
Race_5
year
Athlete
Gender
Model number:
4
Confidence intervals
95
Number of bootstrap samples
10000
Save bootstrap estimates
Bootstrap inference for model coefficients
Y variable:
YAACQtoW
X variable:
CLASStot
Mediator(s) M:
BACtypW
drkpdayW
Covariate(s):
Moderator variable W:
Moderator variable Z:
Do not use PASTE button
About
Options
Multicategorical
Long variable names
OK
Paste
Reset
Cancel
Help

```
************************ DIRECT AND INDIRECT EFFECTS OF X ON Y ************************

Direct effect of X on Y
     Effect         se          t          p       LLCI       ULCI
      .1770      .0275     6.4249      .0000      .1228      .2311

Indirect effect(s) of X on Y:
             Effect     BootSE   BootLLCI   BootULCI
TOTAL         .0558      .0152      .0281      .0878
BACtypW       .0334      .0143      .0079      .0636
drkpdayW      .0224      .0188     -.0117      .0624
```

Thank you!

Information adapted from:

Braitman, A. L. (2010, April 16). *Moderation and mediation* [PDF handout]. WordPress. https://fs.wp.odu.edu/abraitma/wp-content/uploads/sites/1682/2016/05/Mediation-and-Moderation_04-2010.pdf

Henson, M. (2020). *Statistics & research methods II: Psych 728/828 Chapter 15* [PowerPoint slides].