

PSYC 1450 Research Methods Lab

Session 4, week of 10/3



[Bit.ly/PSYC1450F22_QC](https://bit.ly/PSYC1450F22_QC)

OH + Contact:

Tue 1-2pm / Thur 2:30-3:30pm / by appointment
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Annotation: For this class, I always included a link to an anonymous submission form for students to submit any questions or concerns. I wanted to give them an alternative way of engaging with the course material, while also allowing them to tell me about any ways the class felt un-inclusive.

Today's lab

- Experiment proposal feedback
- Main effects and interactions
- Third variables
- Group assignments for projects and brainstorm time
 - Presentations in two weeks

Annotation: In this class, I begin by giving them general feedback on an assignment they submitted. I use this feedback as an opportunity to review basic concepts from the course. This then leads to a longer digression on main effects and interactions, which is hands down the concept that students struggle with the most in the course. Then after a break we do a mini lesson on third variables, in which I give students an opportunity to collaborate with others and build on the base layer of knowledge I've attempted to provide.

Experiment proposal feedback

- What makes a good hypothesis?
 - “I think all Columbia professors are evil lizard people from another planet.”
 - Why do you think that? Do you have prior information to suggest this?
 - What does the introduction of a paper typically contain? Why?
 - Your hypothesis **must** have context and theoretical basis
 - With a partner, provide theoretical basis for the following hypotheses
 - Warm coffee will lead to more interpersonal warmth perception
 - The hypothesis the authors put forth in the paper you read
- How does your study build on and fill in the gaps of other studies?



Annotation: I teach through questions. For each common mistake I saw on their “Experiment Proposal” assignments, I break that mistake down into a series of questions to give them practice thinking through this type of problem. Here, I demonstrate how to effectively justify hypotheses with an example that is easy to approach and understand.

Experiment proposal feedback

- Imagine you want to test the effect of cute animal pictures vs ugly animal pictures on emotion. Which is a better question to measure emotion? Why?
 - How happy do you feel, on a 1-7 scale?
 - Based on the images you just saw, how happy do you feel, on a 1-7 scale?
- **Demand characteristics** are hints/cues that make a research participant aware of what you're studying
- Operationalize your DVs with more than a single question
 - Operationalize confidence after watching a motivational video
 - With a single question
 - With multiple questions
 - How would we create a single confidence score from multiple questions?

Annotation: It should be noted that all of these slides have animation, and the answers to questions appear after I've given students the opportunity to think through it themselves or with a partner

Experiment proposal feedback

- What makes a good control condition?
- If you want to test the effect positive feedback has on performance, what makes a good control condition?
- More examples:
 - The effect a scary video has on stress
 - The effect of an embarrassing conversation on blushing
 - Whether reading about bugs makes you more likely to become an entomologist

Main Effects vs. Interactions

- Main Effects: compares different levels of one independent variable
 - Example: Does taking an exam in the morning vs. evening affect exam performance? IV = time of day
- Interactions: compares how the effects of one IV depend on another IV
 - Example: Does the effect of taking an exam in the morning vs. evening on performance depend on the type of exam? IVs = time of day & type of exam

Annotation: In my speaker notes, I make a point of mentioning that this topic is exceptionally difficult! I want students to know that it's normal to struggle through this type of content. In doing so I hope to make them feel less dejected if they don't understand something at first.

Main Effects & Interactions

Imagine you are a hard-core camper and scientist. You want to know if campers' stress is reduced after they camp with friends or camp by themselves, either with a tent or without one. You recruit fellow hard-core campers as participants and randomly assign them to groups.



Alone or in a group



Tent or No Tent

Annotation: My example here is again approachable and easy to understand, which isolates the most difficult component (main effects vs interactions)

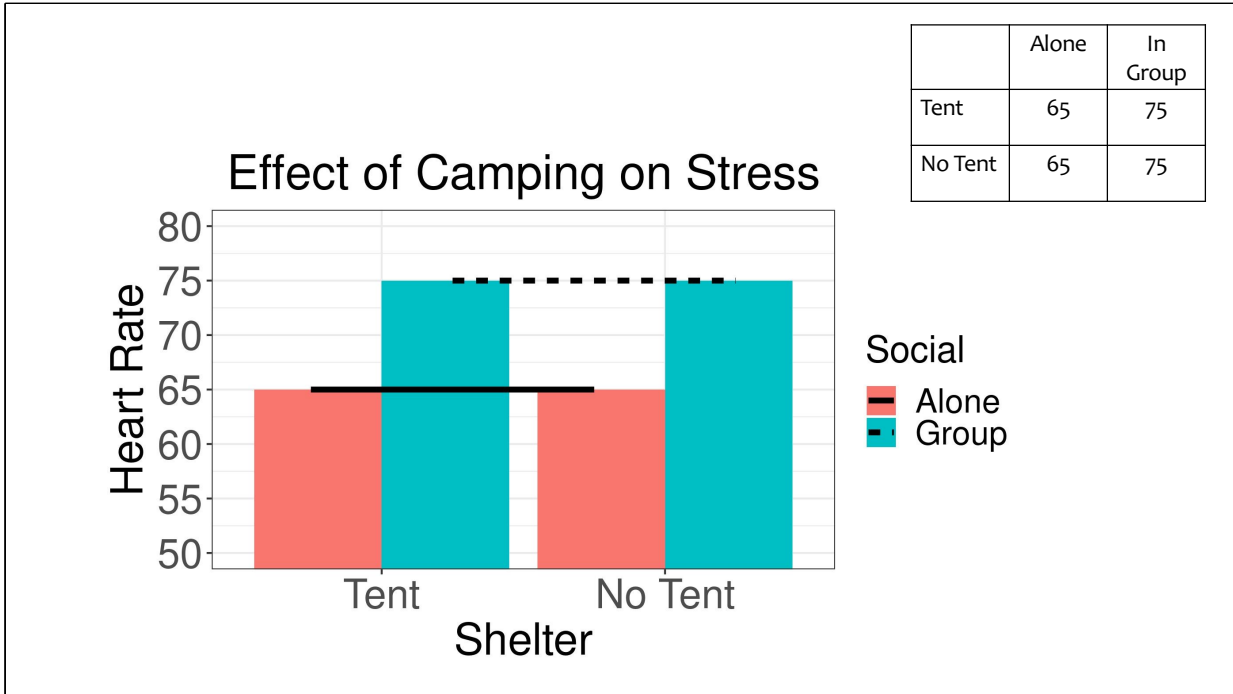
Main Effects & Interactions

- IVs
 - Social Environment:
 - 1) Alone
 - 2) Group
 - Shelter Environment
 - 1) Tent
 - 2) No Tent
- DV: stress (operationalized as Heart Rate)

Stress

IV: Social Environment

		Alone	In Group	
IV: Shelter Environment	Tent	65	75	70
	No Tent	65	75	70
		65	75	

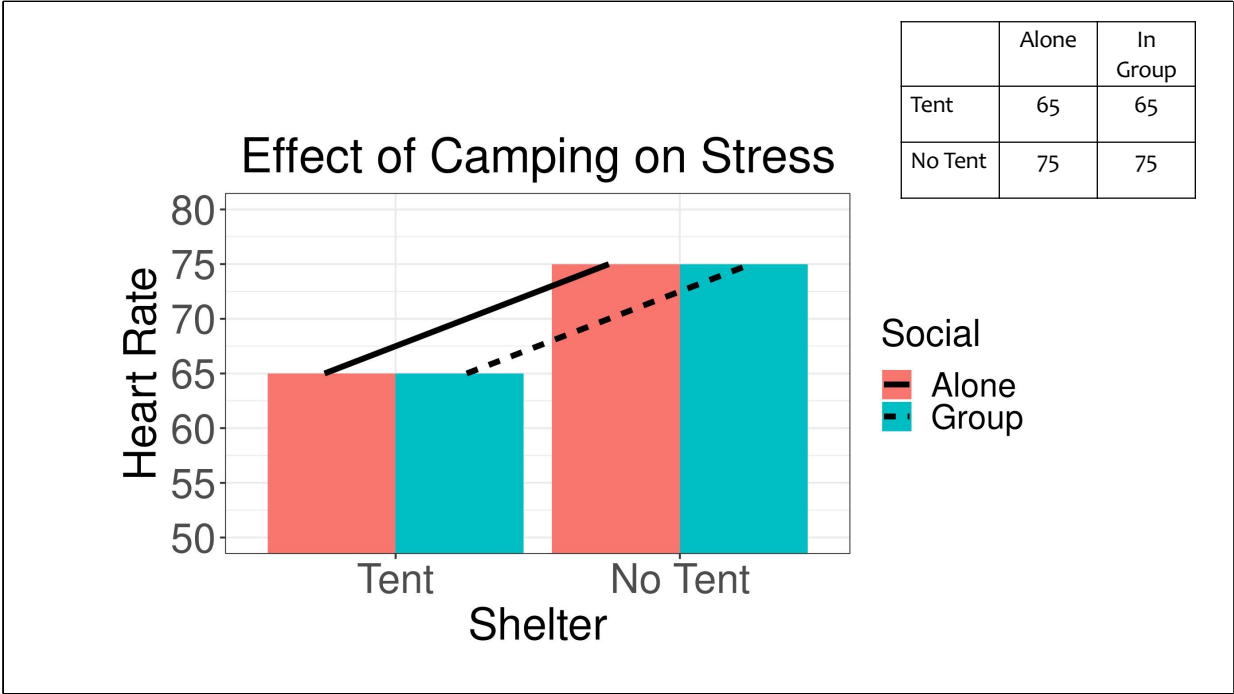


Annotation: The relationship between data and a graph is very important for this class, so I show both to show how we get from one to the other. For each example I ask the class to tell me if there's a main effect of IV1/IV2 and/or an interaction. I try to give them rules for both ways of presenting data – numbers and a graph – for how to check if each effect is present.

Stress

A new group is sampled that produces these results

		IV: Social Environment		
		Alone	In Group	
IV: Shelter Environment	Tent	65	65	65
	No Tent	75	75	75
		70	70	

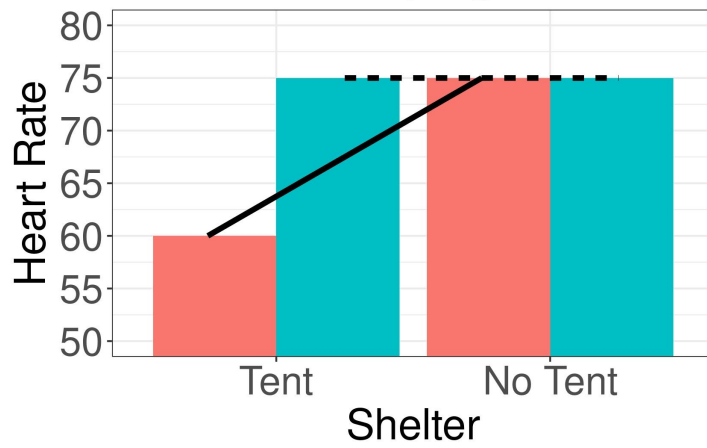


Stress

A third group is sampled obtaining these results

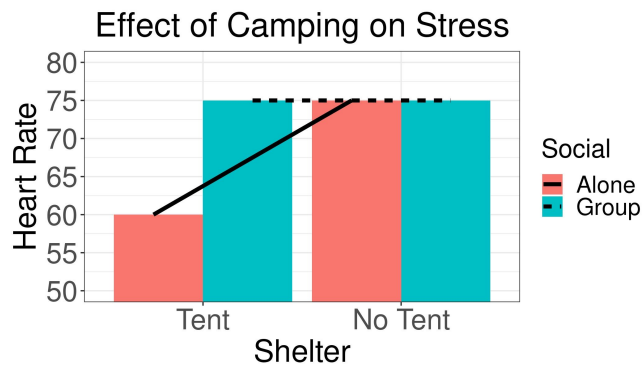
		IV: Social Environment		
		Alone	In Group	
IV: Shelter Environment	Tent	60	75	67.5
	No Tent	75	75	75
		67.5	75	

Effect of Camping on Stress



	Alone	In Group
Tent	60	75
No Tent	75	75

Social
— Alone
— Group



How do we know if there's an interaction effect? What can you look for?

Look for differences for one variable, say Tent – we see a difference of 15 for Group vs Alone.

Now do the same for No Tent – we see a difference of 0 for Group vs. Alone.

The differences are ***different***.

The effect of one IV (Shelter Environment) is different across different levels of another IV (Social Environment)

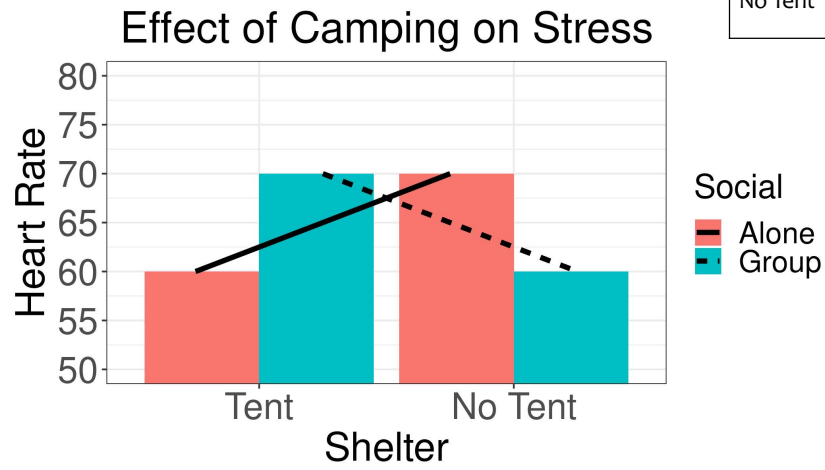
Stress

A final group is sampled obtaining these results

		IV: Social Environment		
		Alone	In Group	
IV: Shelter Environment	Tent	60	70	65
	No Tent	70	60	65
		65	65	

A final group is sampled that produces these results

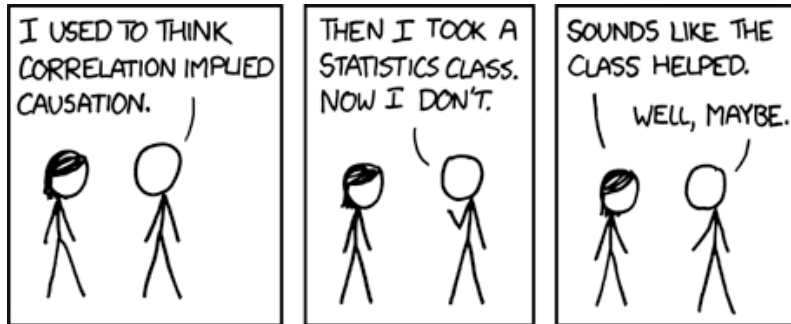
	Alone	In Group
Tent	60	70
No Tent	70	60



Break



Correlation ≠ Causation



"The hot coffee was correlated with rating a target as having a warm personality" ≠ "holding hot coffee caused the participant to rate the target as having more warm personality"

xkcd.com

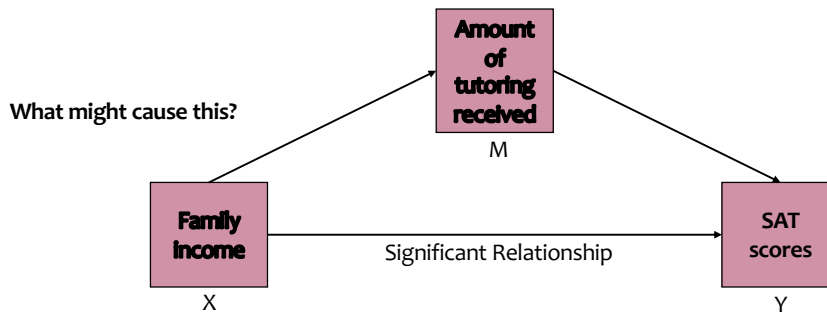
Annotation: In my speaker notes I say to skip this portion of the lesson if we run out of time. I always try to design my lessons to be flexible, since sometimes it can be really difficult to predict how long things will take. I usually pack in too much and need to cut things in the moment.

The third variable

- If correlation doesn't imply causation, then what does correlation imply? Why are correlations useful?
- Perhaps X doesn't directly cause Y. How might variable M make it *seem* like X causes Y?
 - Mediation
 - Spuriousness
- Confounding variable: variable systematically related to the IV

Mediation

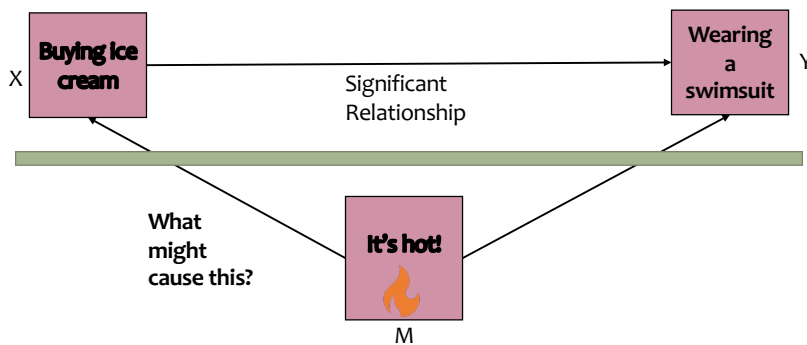
- A third variable that explains a significant relationship between two other variables
- If you can hold the third variable constant and the relationship disappears, that's a good indication mediation is occurring



Annotation: This example comes from an example in a previous class. This is another thing I try to do in my teaching: draw threads through common concepts/examples throughout the course. If you can find a good example, it can be “flexible,” meaning it can be used as a teaching tool across a number of different contexts. The relationship between family income and SAT scores was originally used in an earlier lesson to talk about operationalization.

Spuriousness

- A third variable that separately causes both X and Y
- X and Y are correlated not because they are actually linked but because something else causes both



Noise

- Nuisance Variable: variable associated with the DV that is outside of the influence of the IV—adds noise
- Imagine we want to know whether playing with bunnies lowers people's stress levels.
 - IV = play with bunnies (park) vs. don't play with bunnies (library)
 - DV = stress (operational DV = heart rate)
- Confound?
 - Weather
- Noise?
 - Resting heart rate variability, caffeine



Your experiments

- Think about potential confounds and sources of noise for the experiment you wrote about in your proposal. With a partner, discuss:
 - Are there any potential mediating variables?
 - Are there any variables that might be causing a spurious correlation?
 - Are there any variables that might interfere with the DV and create “noise”?
- Sometimes it can be easier to see confounds in other’s experiments than your own!

Annotation: Here I give students an opportunity to directly apply what they’ve just learned to their own projects, with the help of a partner. This exemplifies my teaching strategy of providing students with a base layer of knowledge, and then allowing them to collaborate with others to expand on it. I’m also encouraging students to be self-critical, to think about what issues others might raise with their work.

Group Project Time



Group Dynamics

- What does it take to be a good group member?
- What will you do to make sure everyone is involved?
- Note: you will all be grading the contributions of your fellow group members, so make sure you do a good job

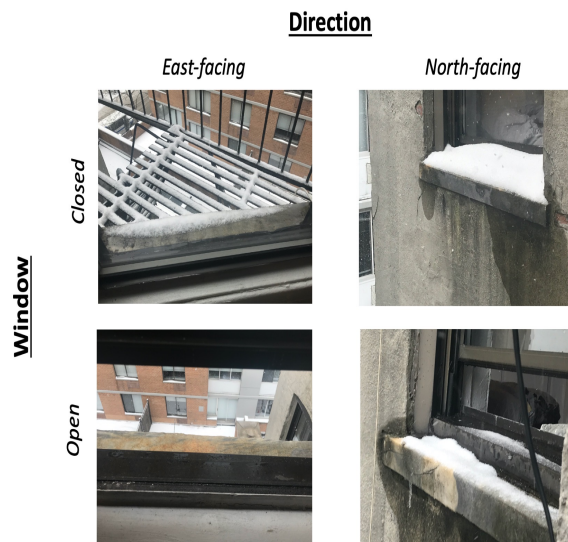
Annotation: Co-creation of community norms is something I try to do in all my classes. I find it goes a long way to creating a culture of respect amongst my students.

Group Project Guidelines

- Groups of 3-4 students (pre-assigned)
- Cannot be an observational (correlational) study
- Should be a **true experiment** (random assignment)
- 1 IV with 2 levels (e.g., Mood: Happy, Sad)
 - can be within or between-groups study design
- MUST be administered via pen-and-paper, Google Forms, or Qualtrics
- Keep it simple!
- Total experiment time should not last more than 10 minutes

One more example

- Let's graph this together



Annotation: One more very silly interaction example that I'm always very excited to present because I came upon it in the real world, AKA my apartment. The DV here is the amount of snow that accumulates on a window sill. Interaction effects are everywhere!