

Cannabis and Health

Module 3

Lecture 4: Internal and External Validity

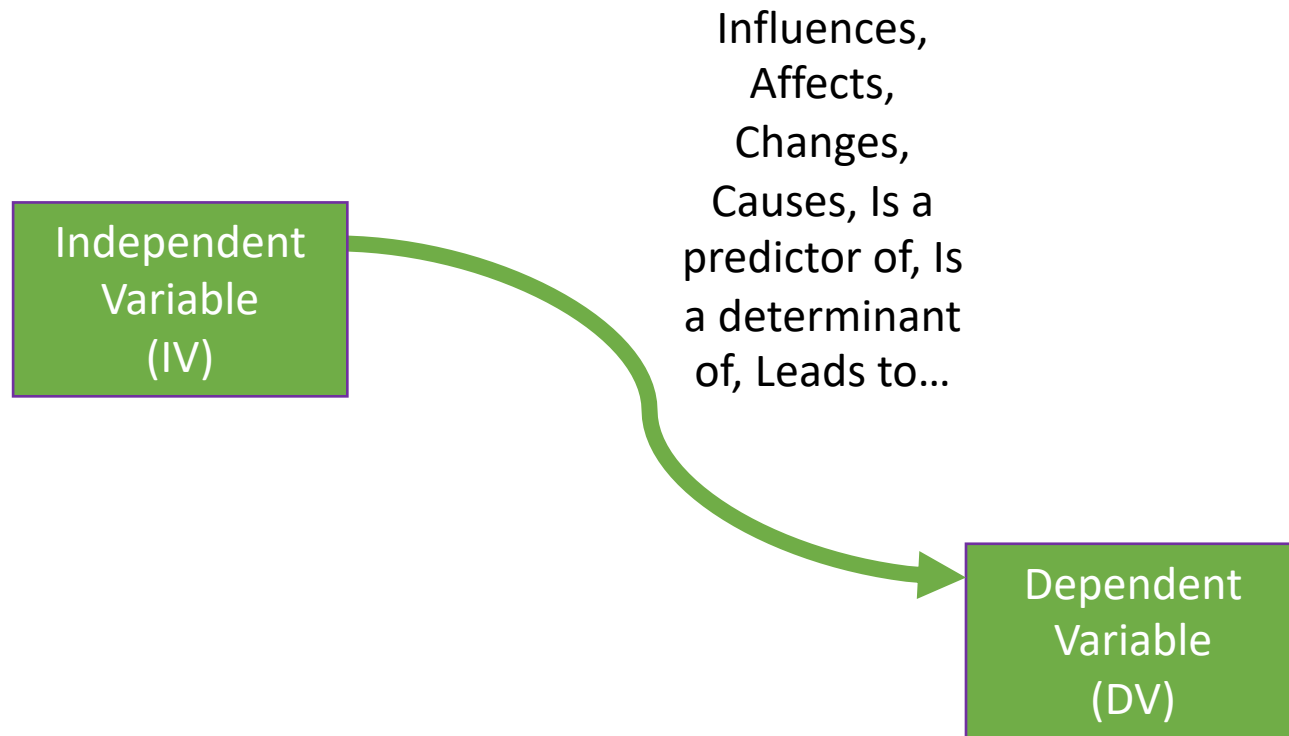
What makes an empirical study good?

- The best empirical studies maximize two important types of validity



- This is difficult to do because, as you'll see, these validities are often in conflict with one another

First, some definitions.....



For example.....

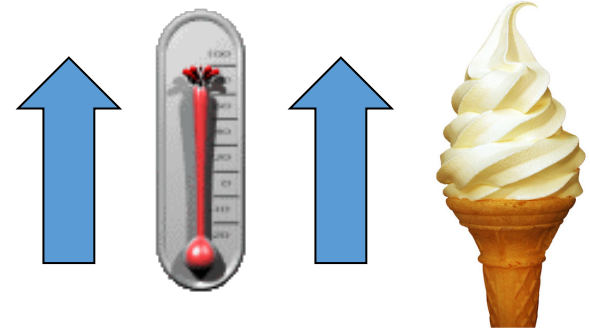


Internal Validity

- **Definition:** the extent to which a valid CAUSAL statement can be made about the effects of an independent variable on the dependent variable
- In our example, how confident are we that cannabis use causes reduced pain?

Causal claims require 3 things:

1. Covariance:
As the IV changes,
the DV changes.



2. Temporal Precedence:



The IV has to happen before
DV. Not vice versa.

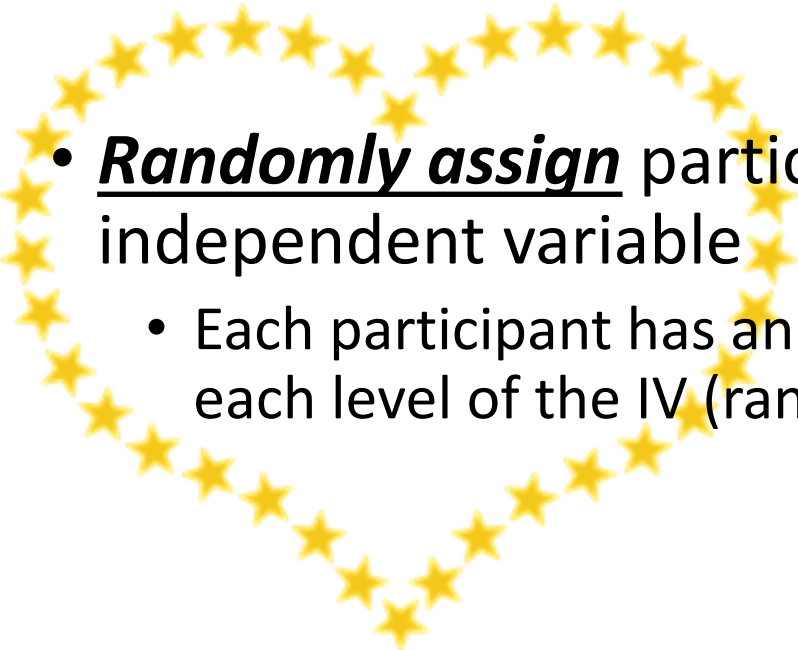
**3. Exclusion of Alternative
Explanations:** Could anything BESIDES the IV have
caused changes in the DV?

To Increase Internal Validity...

- 
- **Manipulate the IV:** *you must vary levels of the independent variable in controllable ways*

- The use of a “control” or “comparison” condition allows you to see what might have happened under different circumstances
- In our cannabis and pain experiment, we might compare cannabis to advil or to a placebo

To Increase Internal Validity...

- 
- **Randomly assign** participants to levels of the independent variable
 - Each participant has an exactly equal chance of being in each level of the IV (randomized experiment)
 - Virtually eliminate the possibility that extraneous variables influenced your dependent variable
 - Distributes extraneous variables evenly across conditions

Increasing Internal Validity: How are Smiling Professors Perceived?



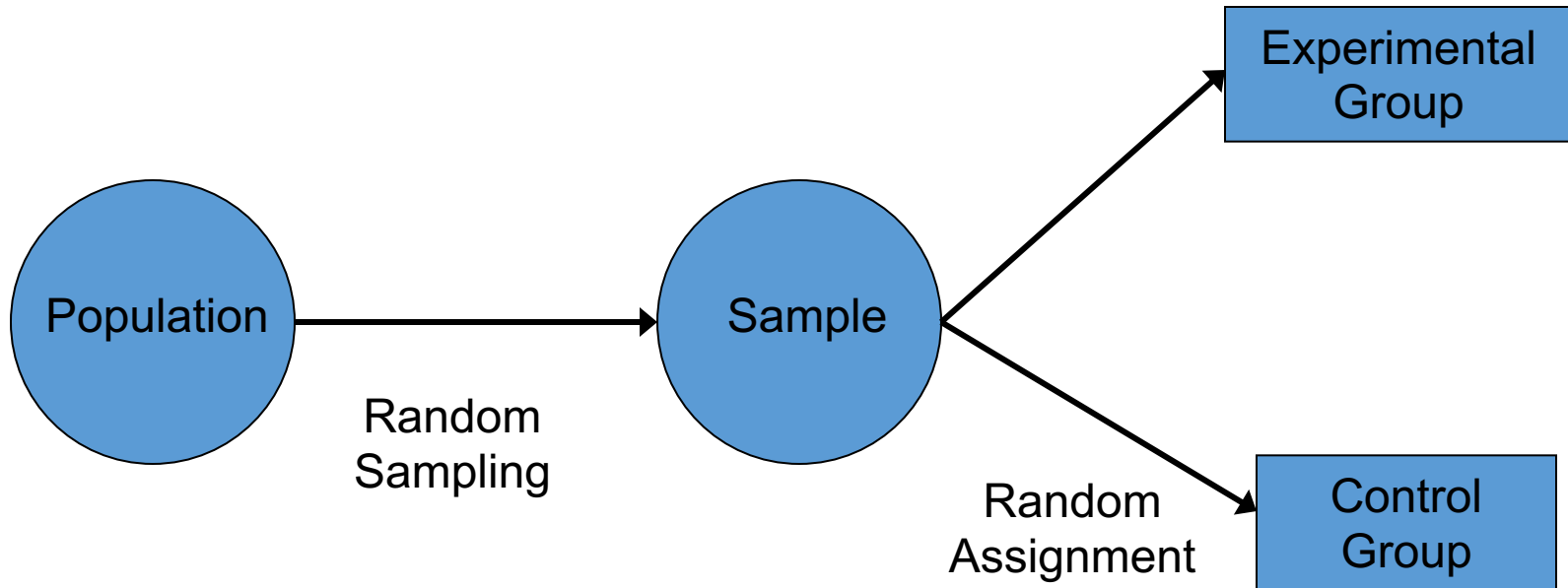
- <https://www.youtube.com/watch?v=NotlObqzav0>
- While you watch this video, make sure you can identify the IV, the DV, and the ways in which internal validity is strengthened

External Validity

- **Definition:** the degree to which results of a specific study can be generalized to other people, places, times, or empirical realizations of the independent variable (also known as generalizability)
- To increase external validity with regard to PEOPLE
 - Be explicit about the population
 - Randomly sample from that population
- In our example
 - Is the effect of cannabis on pain the same whether it is edible or inhaled or topical?
 - Is the effect of cannabis on pain the same for older people as for younger people?

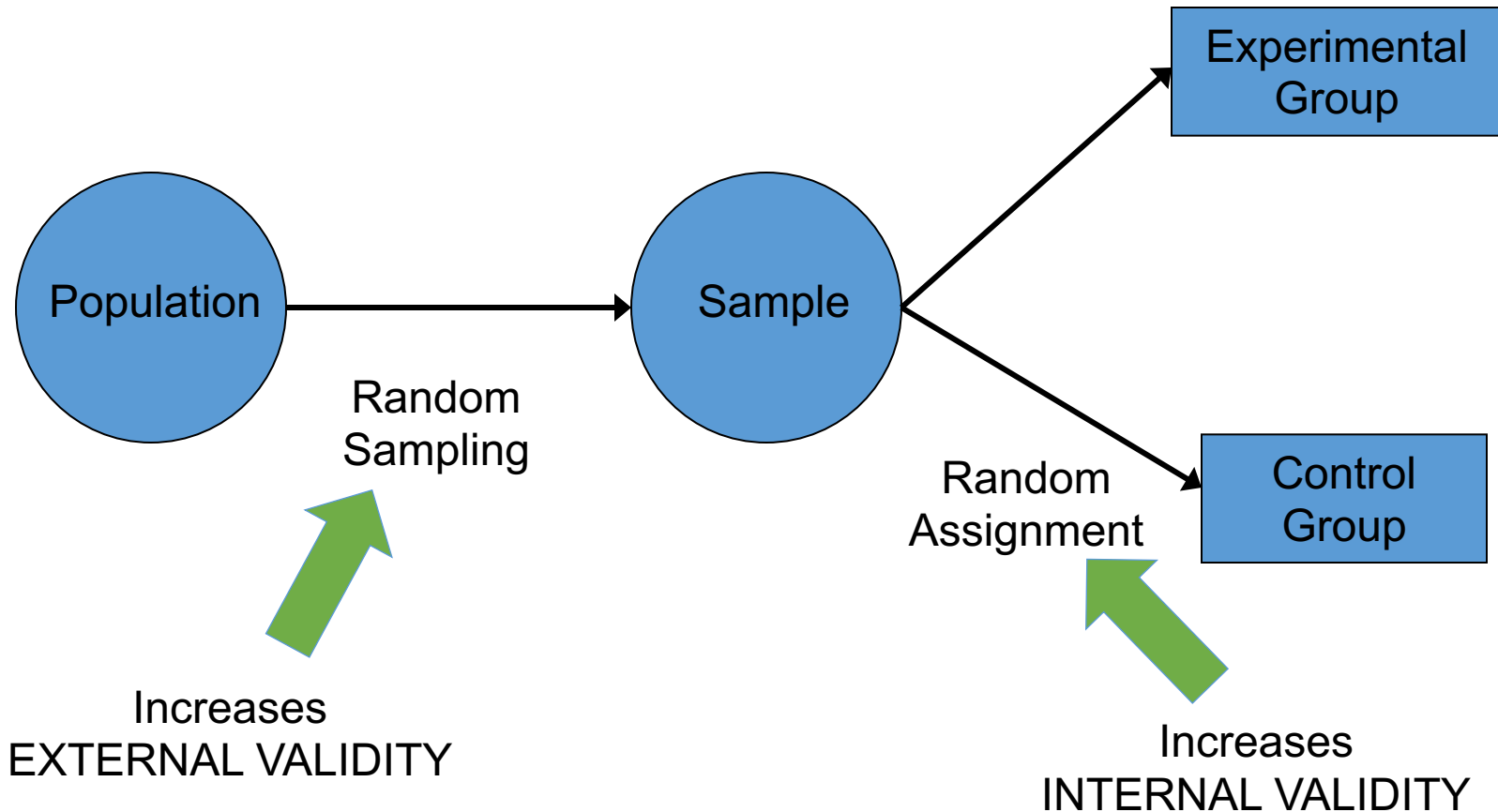
Internal versus External Validity

Random what?



Internal versus External Validity

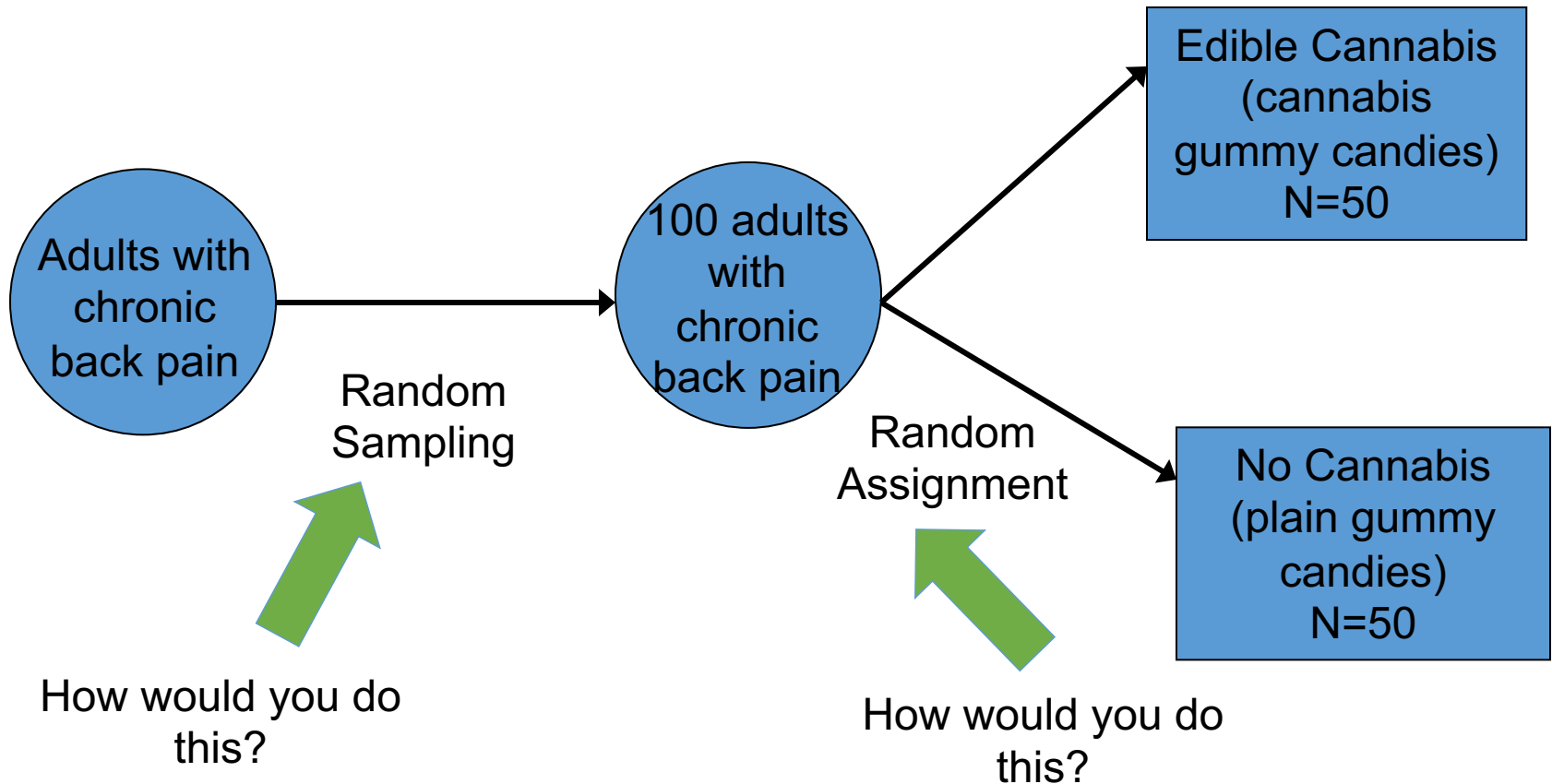
Random what?



Designing a study on cannabis and pain

- We are interested in whether edible cannabis products reduce pain
- We want to be able to generalize our results to adults with chronic back pain
- What would the study look like?

Cannabis and pain study



Dilemma: balancing internal and external validity



Research with Animal versus Human participants

- Do studies with animals or humans maximize internal validity?
 - Why?
- Do studies with animals or humans maximize external validity?
 - Why?

Animal studies

- Strengths

- Tight experimental control over alternative explanations
- Ability to randomly assign to condition
- HIGH INTERNAL VALIDITY

- Weaknesses

- Unrealistic conditions
- Massive doses
- LOW EXTERNAL VALIDITY



Human studies

- Strengths
 - Realistic conditions
 - Doses that humans actually consume
 - HIGH EXTERNAL VALIDITY
- Weaknesses
 - Much less experimental control over alternative explanations
 - LOW INTERNAL VALIDITY



Summary

- Internal validity is the extent to which a valid CAUSAL statement can be made about the effects of an independent variable on the dependent variable
 - For example, how confident are we that cannabis use causes reduced pain?
- External validity is the degree to which results of a specific study can be generalized to other people, places, times, or empirical realizations of the independent variable (also known as generalizability)
 - For example, is the effect of cannabis on pain the same whether it is edible or inhaled or topical?
 - Is the effect of cannabis on pain the same for older people as for younger people?

Discussion prompt: Is there a double standard regarding external validity?

- For 50 years, THC (isolated, synthetic) assumed to generalize to THC in flower even though there are other chemicals in flower in studies on harm related to THC
- Now some argue that when it comes to “medicine” plant derived CBD produced by GW Pharma is NOT the same as plant derived CBD from anyone else