# Lecture 12: Special Research Designs

Wednesday, Oct 11, 2023

Your Teaching Fellows:

| | | |
|---|---|---|
| 003/004: | Zahra Abolghasem | Bronwen Grocott |
| | Vasileia Karasavva | Ni An |
| 010: | Thalia Lang | Malina Lemmons |
| | Ruoning Li | Irene Wen |

Lectures: MWF 12:00 PM – 1:00 PM (003); 1:00 PM – 2:00 PM (004); 2:00 PM – 3:00 PM (010)
Office hours: Tuesdays 2:00 PM – 4:00 PM

**Grad School Series Part -1 on Friday, 13th October from 6 PM to 7 PM at IKB 182**

- Is grad school the next step for you?
- How to find out which grad school is a better fit for you?
- What are UBC grad school applications like?
- What are the requirements for applying to Grad school?

**Details of the event:**
**What:** Grad School Series Part- 1
**When:** Friday, 13th October from 6 PM to 7 PM
**Where**: IKB 182
**Who:** PSA Members only (RSVP required):
https://qualtricsxm24fw5jjhs.qualtrics.com/jfe/form/SV_6EuMg1PbBeLpFDo?fbclid=IwAR38CgTTvkDAwCvbWTKL-YZEWYGYyn1LAdc-qmGLAQ9OL728k448e3oaUAc

# Make-Up “Monday” on Thursday

- We don’t need to have class. Stay home and chill.
- Or not. Doesn’t matter – as long as you’re not coming here for a class that won’t happen

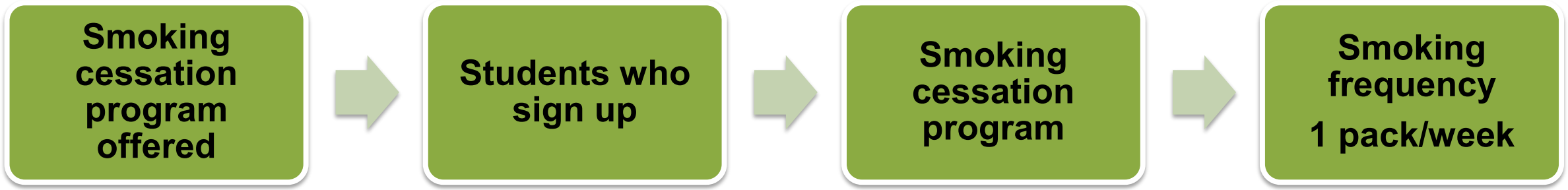
# A Question!

- What is the difference of construct validity and internal validity, and could you give an example of the two?

Internal validity: Study design

Construct validity: Operationalisation

# A Question!


Smoking cessation program offered
Students who sign up
Smoking cessation program
Smoking frequency
1 pack/week

# A Question!

- Internal validity:

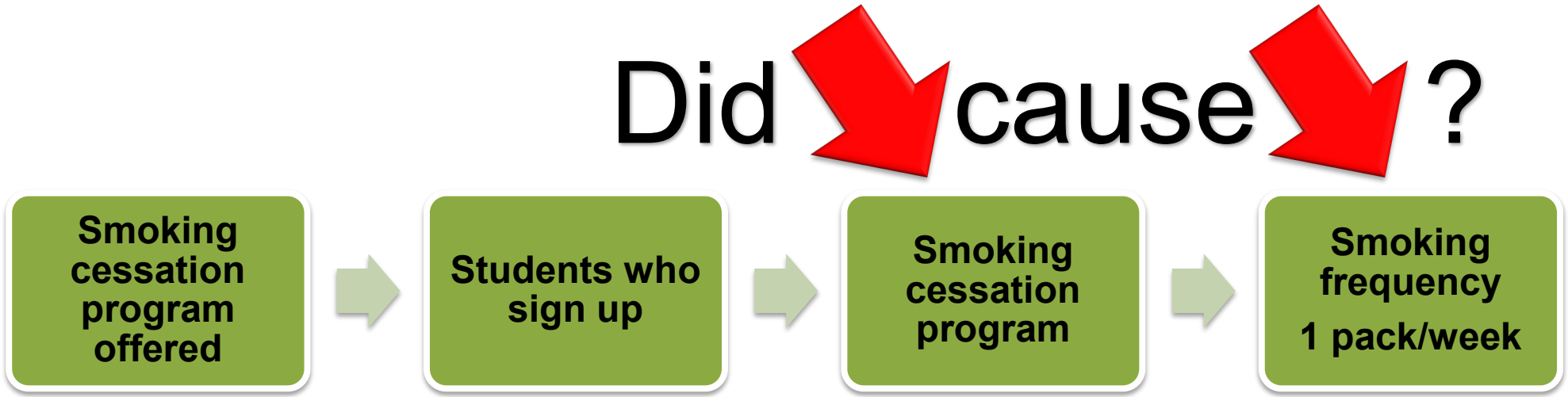
Change in IV → **Change in DV**

Confounds?

Alternative explanations?

Concerned about setup of study

# A Question!


Did
cause
?
Smoking cessation program offered
Students who sign up
Smoking cessation program
Smoking frequency
1 pack/week

# A Question!

- Construct validity

**Operational definition**

**=**

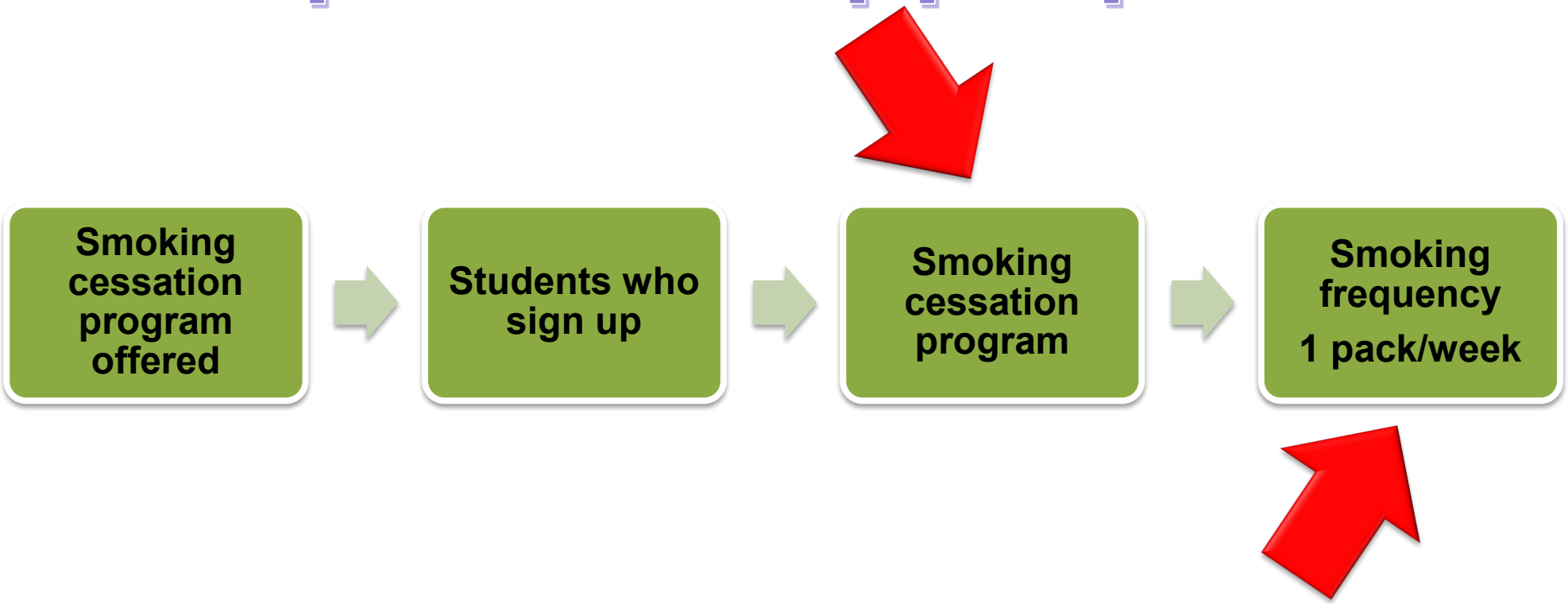
**Construct (Conceptual variable)**

Do they reflect the same thing?

Variables measured/manipulated properly?

# A Question!

## Manipulation appropriate?




## DV measures what it should?

# A Question!

- Internal validity independent from construct validity

Internal validity

Angry thoughts

Construct validity

# A Question!

- Internal validity independent from construct validity

Internal validity

Willingness to watch Netflix

Construct validity

# Designs and threats

- ABA reversal design
- One-group posttest only
- One-group pretest posttest
- Non-equivalent control group
- Non-equivalent control group pretest posttest

- History
- Maturation
- Testing
- Instrument decay
- Regression towards the mean

Weak against this?

Strong against this?

Not applicable?

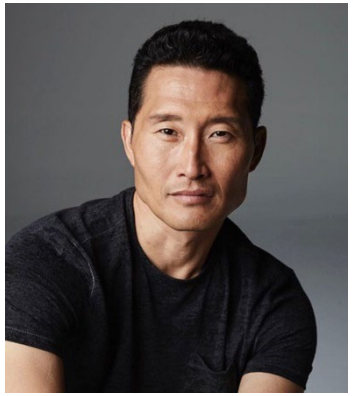
| | History | Maturation | Testing | Instrument decay | Regression towards the mean |
|---|---|---|---|---|---|
| ABA reversal design | | | | | |
| One-group posttest only | | | | | |
| One-group pretest-posttest | | | | | |
| Non-equivalent control group | | | | | |
| Non-equivalent control group pretest-posttest | | | | | |

I'm blind!
Oh, shit!
I'm blind!

# Developmental designs

- Cross-sectional

30 year-old men



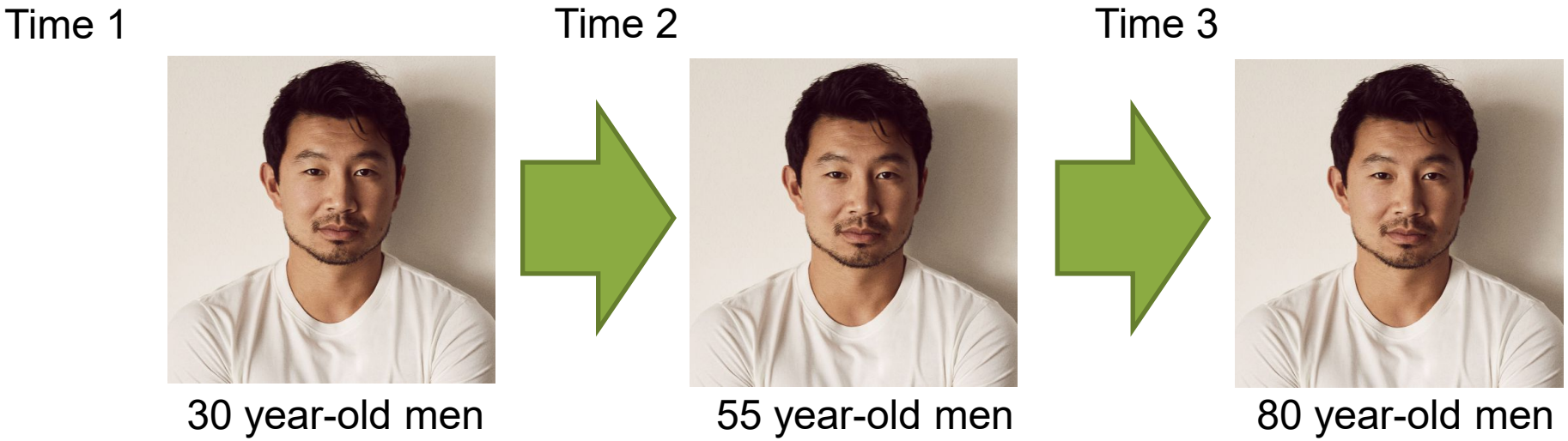
55 year-old men

80 year-old men

Willingness to believe random things they read on the internet

# Developmental designs

- Longitudinal



# Developmental designs

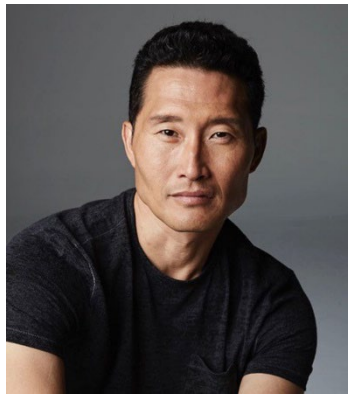
- Integrate? Sequential

Time 1 Time 2 Time 3

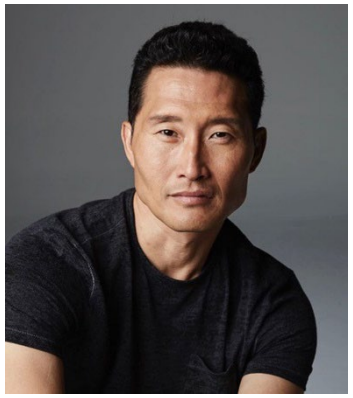
30 year-old men

50 year-old men

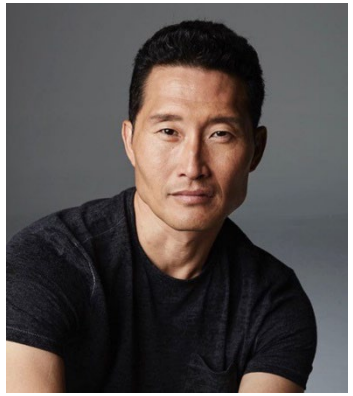
70 year-old men



55 year-old men



75 year-old men



95 year-old men

# Learning Objectives

- By the end of this class, you will be able to:
  - Explain a benefit of factorial designs
  - Interpret main effects and interaction from a graph and a table
  - Explain an interaction effect using simple main effects

# Complex Study Designs

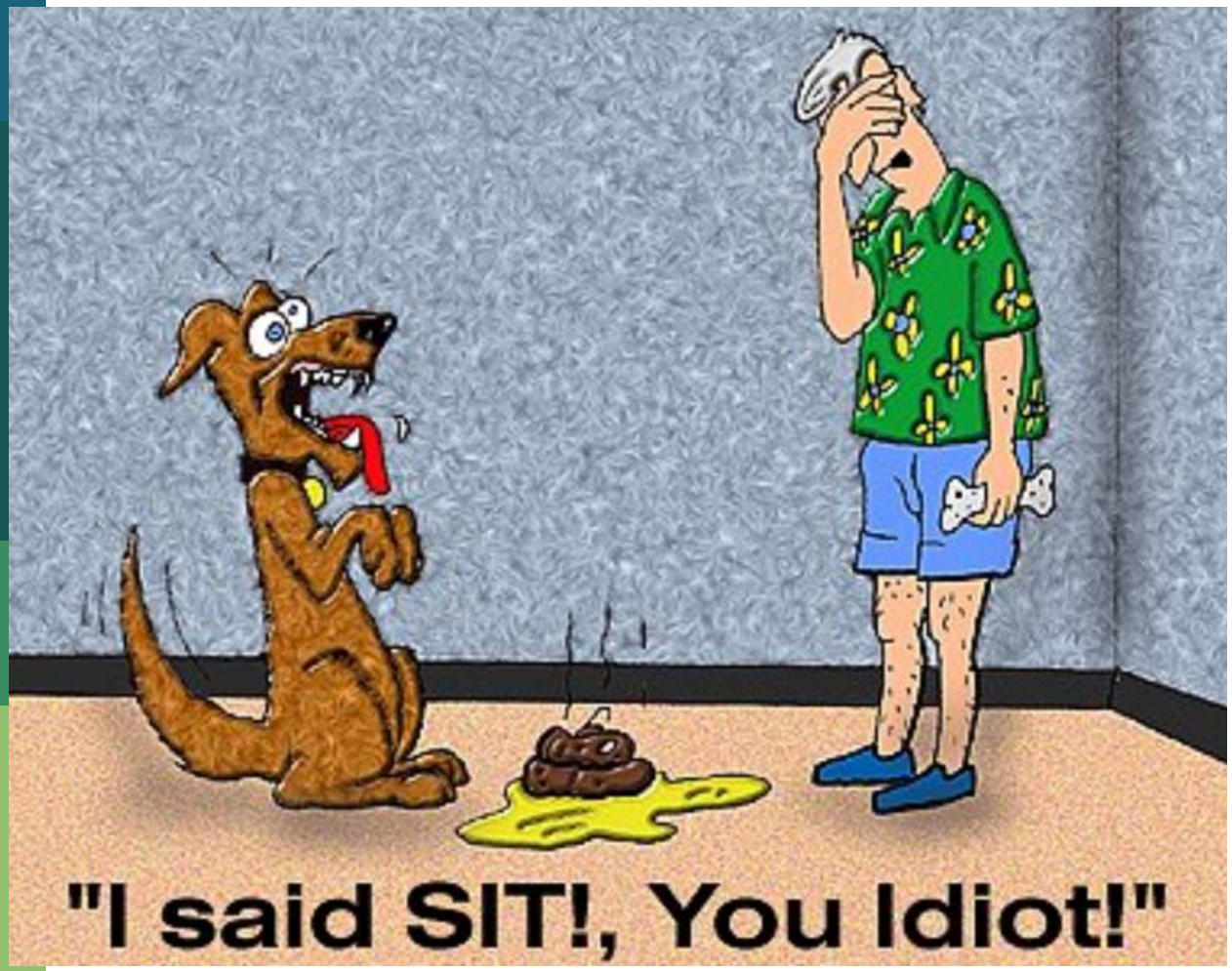
- Complex (factorial) designs = 2 or more factors
  - Factors = any variable that you expect to be related to some outcome variable (e.g. independent variable)

- Progression of discussion of complex (factorial) designs:
  - 2 manipulated factors
  - 1 manipulated factor, 1 non-manipulated factor

# Important definition:

- Interaction:
  - Effect of one factor on the outcome variable *depends on* another factor

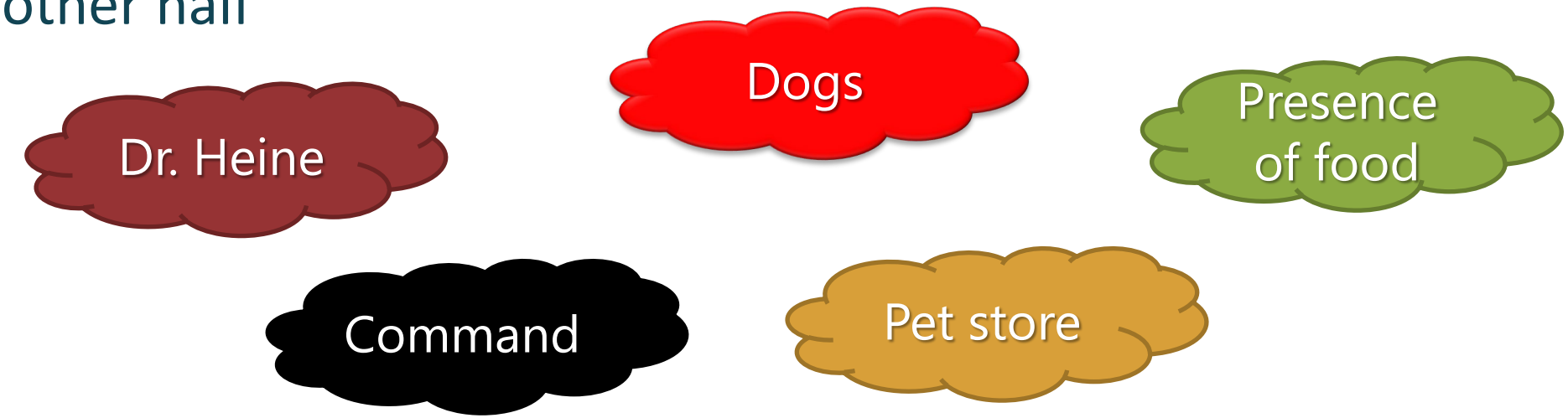
# Factorial designs: An example



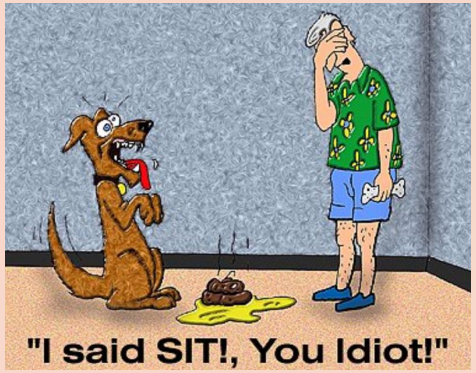
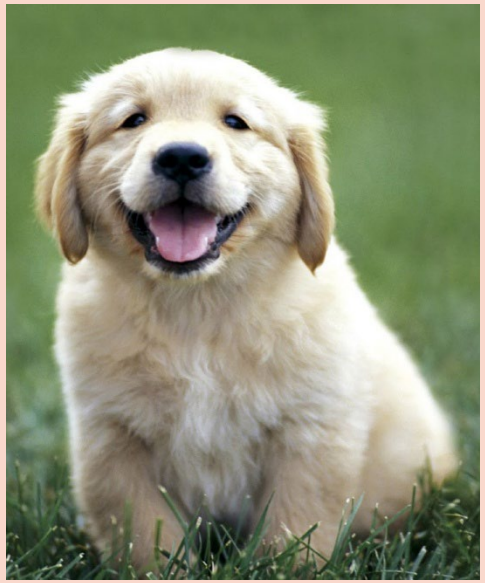
It's Dr. Heine!

# Factorial designs – doggy style

- Dr. Heine experiments on all dogs at neighbourhood pet store
  - Gets 80 dogs
- Command: He tells half of the dogs to sit, and says nothing to the other half
- Presence of food: He holds a treat for half of the dogs, and holds nothing for the other half



# Factorial designs – doggy style

| IV #1: Command (No "Sit" vs. "Sit") | IV #2: Food (No treat vs. Treat) | DV: Proportion of dogs sitting |
|---|---|---|
|  | |  |

# Factorial designs – doggy style

| | | Presence of Food | |
|---|---|---|---|
| | | No Treat | Treat |
| Command | No "Sit" | | |
| | "Sit" | | |

*Cell*

*Known as 2-way factorial design*

*# of factors*

*Specifically, 2 x 2 factorial design (read: 2 by 2)*

*# of levels of first factor*

*# of levels of second factor*

# Factorial designs – doggy style

| | | Presence of Food | | |
|---|---|---|---|---|
| | | No Treat | Treat | |
| Command | No “Sit” | n = 20 | n = 20 | n = 40 |
| | “Sit” | n = 20 | n = 20 | n = 40 |
| | | n = 40 | n = 40 | n = 80 |

# Factorial designs – doggy style

| | | Presence of Food | | |
|---|---|---|---|---|
| | | No Treat | Treat | *Marginal mean of command* |
| Command | No "Sit" | 0.10 | 0.14 | 0.12 |
| | "Sit" | 0.30 | 0.90 | 0.60 |
| | *Marginal mean of presence of food* | | | |

**Main Effect** of Command on the proportion of dogs sitting

# Factorial designs – doggy style

| | | Presence of Food | | |
|---|---|---|---|---|
| | | No Treat | Treat | *Marginal mean of command* |
| Command | No "Sit" | 0.10 | 0.14 | |
| | "Sit" | 0.30 | 0.90 | |
| | *Marginal mean of presence of food* | 0.20 | < 0.52 | |

**Main Effect** of Presence of Food on the proportion of dogs that sit

# Factorial designs – doggy style

| | | Presence of Food | | |
|---|---|---|---|---|
| | | No Treat | Treat | *Marginal mean of command* |
| Command | No "Sit" | 0.10 | 0.14 | 0.12 |
| | "Sit" | 0.30 | 0.90 | 0.60 |
| | *Marginal mean of presence of food* | | | |
| | | +0.20 | +0.76 | +0.48 |
| | | *A few* more dogs sit when commanded to sit | *Way* more dogs sit when commanded to sit | OVERALL: More dogs sit when commanded to sit |