It's a rather interesting phenomenon. Every time I press this lever, that post-graduate student breathes a sigh of relief.

EXPERIMENTAL RESEARCH: OVERVIEW

Week 5

Reading: pp. 113-140 (27 pages)

WHY EXPERIMENT?

Identify cause>effect relationships

Manipulate an *independent* variable (e.g., IV = ice cream flavor) to note effects on a *dependent* variable (e.g., DV = exam performance)

Can run multiple conditions (e.g., participants with pre-existing flavor preferences)

Control for extraneous variables (e.g., respondents who ate prior to the procedure)

PRACTICAL CONSIDERATIONS

Participant recruitment
- Who will you investigate?
- How will you find and incentivize respondents?
- Using a subject pool

Using a standard procedure
- Mitigate experimenters' expectancies
- Single or Double blind? Pilot tests
- Maintain secure records

Manipulation check
- Was the IV successfully manipulated, as perceived by the participant?

Population

Sample
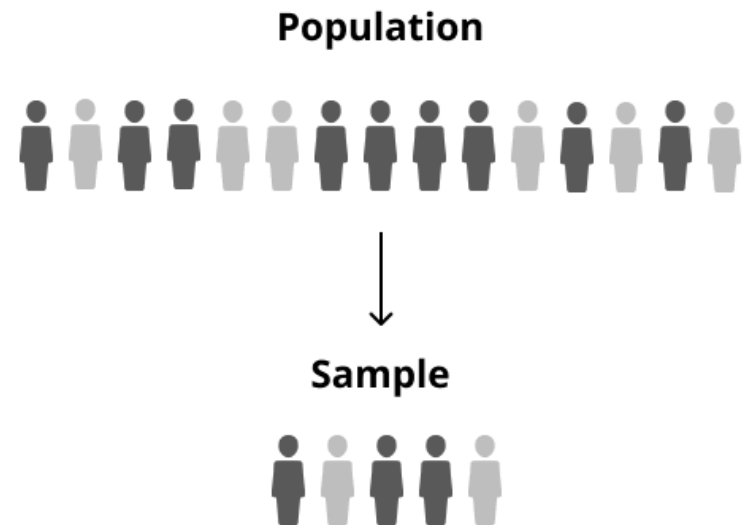
VALIDITY (FOUR TYPES)

Internal validity (causal relationships)

- *Did A cause B?*

External validity

- *Does the relationship between A and B represent real-world circumstances?*

Construct validity

- *Are the constructs adequately defined and operationalized?*

Statistical validity

- *Were appropriate data collection, organization and analytic strategies used?*

EXTRANEOUS PRECAUTIONS

Be wary of <u>extraneous</u> variables (varies in a study context independent of IVs and DVs)

Extraneous influences (e.g., differences in motivation, histories, predispositions, etc) create "noise"

- **<u>Control</u>**: Hold extraneous variables (maximally) constant, random assignment, matched groups design, counterbalancing

<u>Confounds</u> are extraneous variables that systematically varies *with* the independent variable (e.g., baseline aggression ~ violent video games ~ actual violent behavior)

TREATMENT VS. CONTROL

A basic experiment includes (at least) two conditions: Treatment and Control
- Types of Control conditions: No-treatment, placebo, wait-list control

Gold-standard of medical research: **RCT** (**R**andomized **C**linical **T**rial)
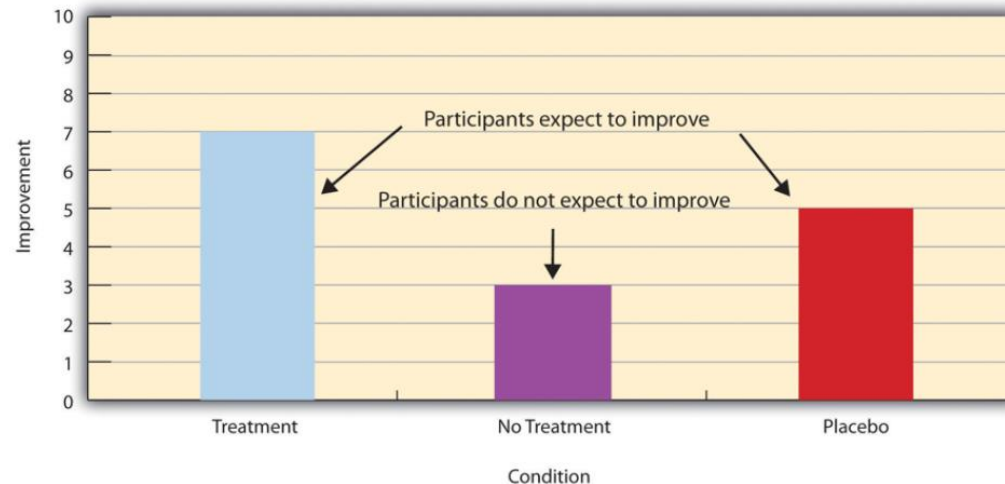
The "best" overall medication?

Figure 5.2 Hypothetical Results From a Study Including Treatment, No-Treatment, and Placebo Conditions

EXPERIMENTAL DESIGN

Between *or* within subjects? Depends on the question…

Controlling for extraneous effects *between* groups (solutions: random assignment, matched groups…)

Controlling for extraneous effects *within* groups (order effects, carryover and practice effects, fatigue, contrast effects)

- Solution: Counterbalancing (complete, random)

General strategy: If time and resources are available, and carryover effects are *not* a concern, use *within-subjects*. Otherwise use *between-subjects*.

Population

Considerations during sampling:
1. Students taking math
2. Gender and Age proportions *(stratified)?*
3. School district?
4. Pre-existing constraints (e.g., learning disabilities, unfamiliarity with language, etc)

Extraneous confounds ('Noise')
1. *Color preferences*
2. *Previous meal content*
3. *Previous history of ice cream preference*
4. *Mood/State effects*

DESIGN
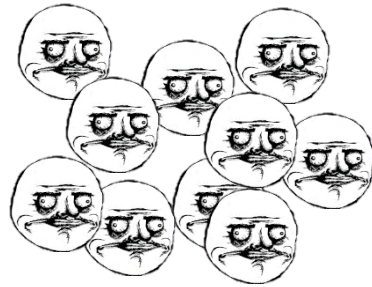
Sample (*n* = 9)
1. Age, gender, disposition-matched (*sacrifice external for internal validity*)
2. From the same school/class/grade scale
3. Did not eat 2 hours prior to procedure

Randomly assign to one of three groups
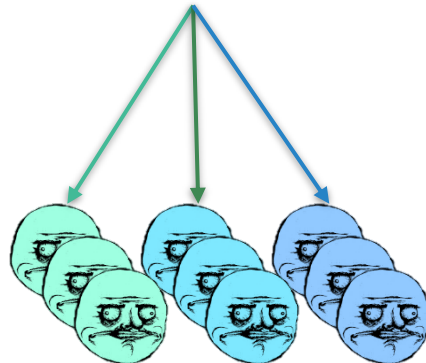
Independent Variable (IV)

3 levels of a single IV – **single factor multi-level design**

Controlling confounds:
1. Previous preference (*response: blindfold*)
2. Mood/State (*response: mood inventories*)
3. Previous meal content (*response: instructions to not eat before-hand*)

Dependent Variable (DV)
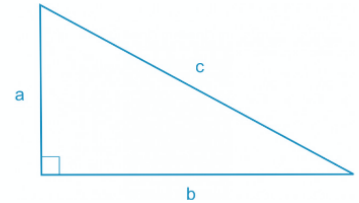
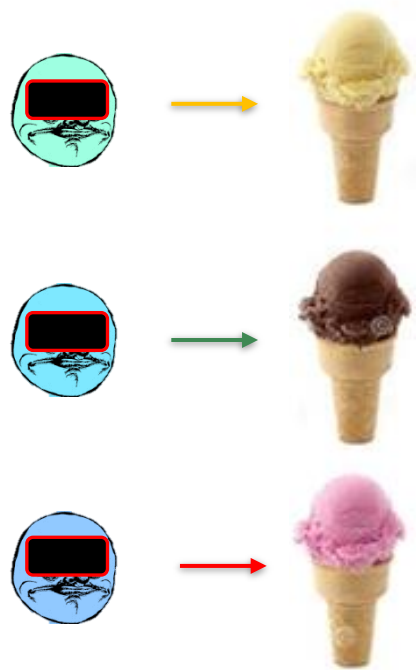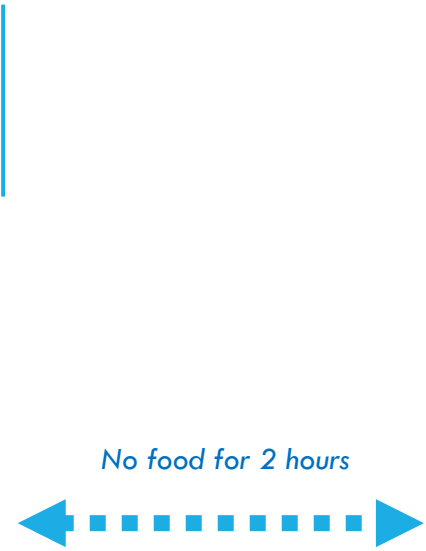Side c measures 35 and side b measures 21. What is the length of side a?

A. 28
B. 32
C. 27
D. 25

What will we measure?
1. Proportion of correct responses across each condition? (*measure: accuracy*)
2. Time to complete exam? (*measure: reaction time*)
3. Self-evaluation of 'relief' or 'dread' (*measure: pre-post evaluations*)

EXPERIMENT

No food for 2 hours

5 min after ice cream

Questionnaire

5 min after questionnaire

Side c measures 35 and side b measures 21. What is the length of side a?

A. 28
B. 32
C. 27
D. 25

Take Exam

Data

1. How many correct answers?
2. How long to complete the exam?
3. Self-reported feelings

ID	Flavor	Accuracy (%)	Time (min)	Satisfaction (1-10)
P1	Vanilla	70	45	7
P2	Vanilla	60	44	5
P3	Vanilla	60	46	7
P4	Chocolate	70	48	6
P5	Chocolate	65	48	8
P6	Chocolate	80	47	8
P7	Strawberry	55	41	7
P8	Strawberry	85	42	5
P9	Strawberry	60	44	9

Mean Time

Mean Accuracies

Mean Satisfaction
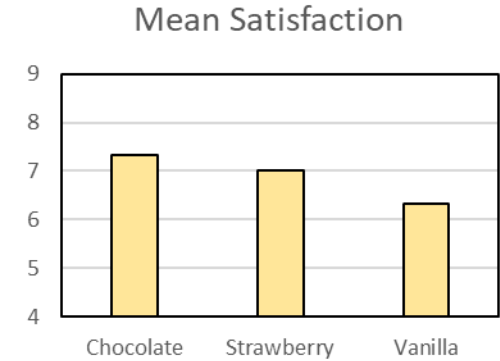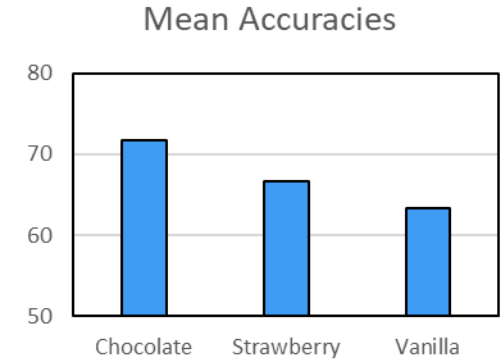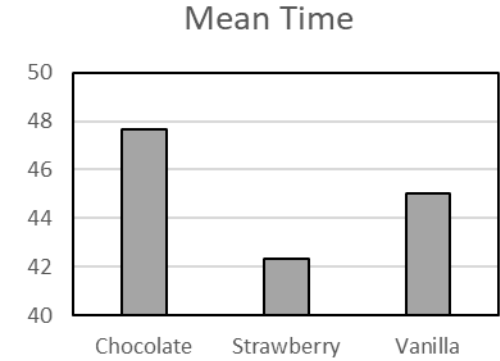
CAUSE-AND-EFFECT QUESTIONS

"Can ice cream flavor influence math performance?"

Research questions can be subjected to causal analysis if two principles are met
- The processes can be constrained by *time* (what happens at *time-1* vs *time-2*)
- Non-manipulated/extraneous conditions can be held *constant* (controlled for)