Methods
Memory and Studying

Operationalizing aggression
• Could have kids report their aggression level
  — Have to control demand characteristics
  • When participants perceive the situation as “demanding” a particular kind of behavior
  • Boys may think it’s good to be aggressive
• Could have an observer count aggressive acts
  — Have to watch for observer bias
  • Observers may expect boys to be more aggressive

Hypothetical results
• Hypothetical aggression scores for 32 boys and 32 girls (higher is more aggressive):
  − Boys = 17.6
  − Girls = 13.5
• Can you conclude, based on this difference alone, that boys are more aggressive?
  − No: need to consider the variability in aggression scores within each group

Inferential statistics
• The larger the difference in means, relative to the variability within conditions, the lower the probability p that the difference occurred by random chance
• A difference in means is statistically significant if p is below a threshold
  − By convention, threshold is .05 (or 5%)
  − E.g., “the difference in mean aggression scores was significant, F(1,30)=6.5, p<.05”.

Variability
Figure 1.9 (from the book)
Same means, lower variability

Was this an experiment?
Was this an experiment? 

[tex]
9/6/19

[link]
msutoday.msu.edu/news/2014/want-a-higher-gpa-in-college-join-a-gym/
Was this an experiment?

Correlational studies

- Correlation: two variables changing together
- **Correlation is not causation**
  - We don’t know the direction of causation
  - We don’t know whether there’s a **third variable**
- What is the direction of causation?
  - more loneliness→ less independence, or
  - less independence → more loneliness?
  - Another example: *Larger parietal cortex, higher IQ*

Correlational studies

- What’s a possible **third variable**?
  - Smart people could have high GPAs and know they should exercise
  - *Drowning deaths and ice-cream consumption*
- To establish causation, it helps to identify a **mechanism** linking the variables
  - Smoking and cancer
  - Greenhouse gasses and global warming

Methods: What we covered

- Research designs: Observational, experimental
- Characteristics of experimental designs:
  - There is some kind of manipulation
    - Can be between participants or within participants
  - Variables: Independent, dependent, confounding
    - Variables have to be operationally defined
  - There are types of validity: Internal, external, construct
  - Given variability in data, we need **inferential statistics**

Memory and studying

**Testing effect**

(Karpicke & Roediger, 2008, *Science*)

- Questions:
  - Can testing help you retain material?
  - How well can we predict our own test performance?
Method

• Materials: 40 Swahili-English word pairs
  – E.g., mashua → boat
  – Called paired associates (or just “items”)
• Procedure:
  1. Learning phase, all in one day
  2. Immediately after learning: Judgment of learning
  3. One week later: Final test

Learning phase

• 8 periods: S T S T S T S T
  – S = study period, T = test period
  – 30 sec of distracting activity after each S

|        | S       | T       | S       | T       | ...
|--------|---------|---------|---------|---------|---------
| mashua | boat    | mashua  |         |         |         |
|        |         |         |         |         |         |

Variables

• Independent variables:
  – Items studied (all vs. nonrecalled)
  – Items tested (all vs. nonrecalled)
  – Manipulated between participants
• Dependent variables:
  – Judgment of learning
  – Proportion recalled on final test

Conditions

Four between-subjects conditions:

ST:
  Studied all 40 items in every S
  Tested on all 40 items in every T
SnTn:
  If you recalled an item in a T,
  it was dropped from all later Ss and Ts
  [n = non-recalled only]

Judgment of learning

• After the learning phase, each participant predicted how many items he or she would recall in a week
  – Average predicted number (out of 40):
    • ST: 20.8
    • SnTn: 20.3
    • SnTn: 20.4
    • SnTn: 22.0
  – I.e., predicted recall was about .5 (proportion)
  – No significant differences between conditions
Recall after a week

Results

- Testing helped retention
  - A lot
    - With these materials
    - And with this sample
  - Just studying more doesn’t help
- Participants couldn’t predict this effect
  - Not reflected in judgments of learning
  - What people tell you isn’t always accurate!

External validity

- Replicates with more complex materials and more realistic tests
  - Typing out a summary of a scientific text is better than doing a concept map (Karpicke & Blunt, 2011)
- Testing material enhances memory for related material (Chan, McDermott, & Roediger, 2006)
  - Important, because we usually don’t know exactly what will be on the test

Evidence-based study tips

- Self-test while you’re studying
- Space out your studying over time
  - Another effect: the spacing effect
  - A given amount of time spent studying helps more for long-term learning if you spread it out in time