Methods
Memory and Studying

Defining a variable
• A definition should be operational
  – Give specific rules for measuring it
  – E.g., rules for measuring aggression
• A definition should have construct validity
  – The variable should measure the construct you’re interested in
  – E.g., do we count playful acts that only simulate aggression?

Operationalizing aggression
• Could have kids report their aggression level
  – Possible problem: Demand characteristics
    • When participants perceive the situation as “demanding” a particular kind of response
    • Boys may think it’s good to be aggressive
• Could have an observer count aggressive acts
  – Possible problem: Observer bias
    • Observers may expect boys to be more aggressive

Hypothetical results
• From 32 boys and 32 girls:
  – Boys’ aggression score = 17.6
  – Girls’ aggression score = 13.5
• Can you conclude, based on this difference alone, that boys are more aggressive?
  – No: also need to factor in the variability in aggression scores within each group

Variability
Figure 1.9 (from book)

In which sample is the difference in means less likely to have occurred by chance?

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, $F(1,30)=6.5, p<.05$.”
Correlational studies

- Correlation: two variables changing together
- Causation is difficult to establish
  - Correlation is not causation
- The causal arrow could point either way
  - Author: more loneliness $\rightarrow$ less independence
  - Why not less independence $\rightarrow$ more loneliness?
  - Larger parietal cortex and high IQ

Testing effect

- Questions:
  - Can testing help you retain material?
  - How accurately 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

Variables

- Independent variables:
  - Items studied (all, nonrecalled)
  - Items tested (all, nonrecalled)
  - Manipulated between participants
- Dependent variable:
  - Judgment of learning
  - Proportion recalled on final test

Conditions

Four between-subjects conditions
- ST:
  - Studied all 40 items in every S
  - Tested 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]

Judgments of learning

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

Results
• Testing helps retention
  — A lot – at least with these materials
  — And studying more doesn’t
• Participants couldn’t predict this effect

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
  — The spacing effect
  — A given amount of time spent studying helps more for long-term learning if you spread it out in time