

Midterm 2 Study Guide

As in the Midterm 1 guide, main ideas of each of the lectures we've had so far (since the last exam) are listed below. All repeated mentions of a given concept following the initial mention are italicized. Again, when studying for the test, set yourself the goal of being able to write a good short essay about each of these main idea topics, and take care to focus on any "what's wrong with this study?" examples discussed in class (there are many in the slideshows noted below) or on the sample midterm. If you don't understand a concept based on the slides alone, use your book and other resources (and ask questions).

Lecture 9 (10/19/2015):

"The problem of scales" pdf (10/19 on syllabus):

- Traditional scales of measurement (slide 16)
- Types of inference that traditional measurement scales allow
- Types of statistics you can calculate using traditional measurement scales
- Reliability v. validity (again)
- Internal v. external validity
- Threats to internal validity (between and within subjects) and how to control for them
- $\text{Data} = \text{Model} + \text{Error} \sim \text{Observed Score} = \text{True Score} + \text{Error Score}$
- Regression to the mean
- Types of reliability (don't worry too much about fine mathematical detail here)

Lecture 10 (10/21/2015):

Part 1: "inference" pdf (10/21 on syllabus, second column):

- Hypothesis testing (again)
- Type 1 and 2 (and 3) errors (again)
- Power, alpha, and beta

Part 2: "subject variables" pdf (10/26 on syllabus):

- Subject variables as extraneous to or part of theory
- Controlling for "extraneous" subject variables
- Trait v. state subject variables
- Problems of within subject designs
- Subject variables as systematic sources of variance
- Subject variables as sources of theoretical variation
- Advantages of interactions over main effects in studying subject variables

Part 3: "Theory Testing" pdf (10/19 on syllabus):

- Theory (definition, components, lots of examples in slideshow)
- Observables
- Latent variables
- Constructs

Lecture 11 (10/26/2015):

Part 1: "Correlational designs (continued)" pdf (10/26 on syllabus; same slideshow as "Correlational designs (reliability)" pdf under 10/21 on syllabus):

Direct v. indirect data
Steps in correlational inference
Reliability v. validity
 $Data = Model + Error \sim Observed\ Score = True\ Score + Error\ Score$
Regression to the mean
The effect of test length on internal consistency
Facets (i.e. types) of reliability
Classical test theory v. item response theory (IRT; again, don't worry about math)
How CAT (computer adaptive testing) utilizes IRT (and pros/cons of CAT)
For more stuff of interest in this slideshow, see Lecture 14

Part 2: "Experiment 2: simulation experiment" pdf (10/26 on syllabus, third column):

NA; has more to do with Paper 2 (reinforces concepts discussed so far)

Part 3: "Simulations as theory testing" pdf (11/2 on syllabus):

One-factor designs: linear, monotonic, and quadratic effects
Two-factor designs: main (additive) effects and interactions (again)

Lecture 12 (10/28/2015):

"Lorien Elleman's guest lecture" pdf (10/28 on syllabus):

Regression
Scatterplot
Bivariate distribution
Regression line
 $Data = Model + Residual$
Examples: Univariate and bivariate normal distributions
Relationship between residual and variance
Mean v. simple linear regression
Causal convention: $y = mx + b$ means that...
Slope of x predicting y is NOT the same as slope of y predicting x
Three questions for determining statistical significance
The meaning of the p value (and of low p) in regression
Covariance
Variance v. covariance (remember about signs here, too)
Covariance and the slope of a regression line (+, -, 0 effects, too)
Correlation
Two reasons to use a correlation rather than a regression
Correlation's relation to (and difference from) regression
Allowable range of values for a correlation, meaning of signs (+, -)
A correlation of r (e.g., .34) predicts...
Correlations v. squared correlations (and unexplained variance)
Correlation: Dark side
Anscombe data set
Spurious correlations

Lecture 13 (11/2/2015):

Part 1: "Observational versus randomized trials" pdf (11/2 on syllabus):

- Observational studies
 - (Defining epidemiology, observational example, confounding variables)
- Randomized field trials as an alternative to observational studies
 - (Two examples: epidemiological and STEM; more potential pitfalls)

Part 2: "Searching the literature" pdf (11/4 on syllabus, second column):

NA; has more to do with Paper 2

Part 3: "A simulation experiment" pdf (11/2 on syllabus):

NA; has more to do with Paper 2

Lecture 14 (11/4/2015):

Part 1: "Correlational designs (continued)" pdf (10/26 on syllabus):

- Harsh parenting example (don't sweat details; know what behavior genetics is)
- Varieties of validity (don't worry about the math on these slides)

Part 2: "Pitfalls" pdf (11/4 on syllabus):

- Investigators v. experimenters
- Investigator effects
 - Paradigm effects
 - Paradigms (what they are, examples in psychology/personality)
 - Paradigmatic thinking as a source of error
 - Design effects
 - Platt on strong inference (*again*)
 - Confirmatory designs, weak inference
 - Correlation, inverse probabilities, and base rates
 - Loose procedure effects
 - Data analysis effects
 - P-Hacking
 - HARKing
 - Fudging effects/scientific fraud
- Experimenter effects
 - Personal attribute effects

Lecture 15 (11/9/2015):

Part 1: "?" pdf (? on syllabus): Slideshow about Experiment 2

NA; has more to do with Paper 2

Part 2: "Pitfalls" pdf (11/4 on syllabus):

- Experimenter effects
 - Personal attribute effects*
 - Failing to follow procedures effects
 - Misrecording effects
 - Fudging effects
 - Expectancy effects
- Recommendations for avoiding investigator and experimenter effects

Lecture 16 (11/11/2015):

"Ethics in Research" pdf (11/11 on syllabus):

Five general principles of APA ethics (be familiar with the main details of each, too)

Eight elements that constitute informed consent

Ties in with seven elements for consent forms, slide 58

When do you NOT have to get informed consent?

Three rules regarding deception in research

Ten tips for avoiding plagiarism ("guide to ethical writing," part 1)

What is an IRB, and what does it do?

Harvard/NU online training slides

Definition of "human subjects" research

Nuremberg Code (history and principles)

Roles and responsibilities of investigator and IRB

Three types of deceptive scientific misconduct

Ethical guidelines: A summary (three points)

Other important material:

Textbook readings (understand concepts below in a general way):

Chapter 11: Analyzing Experimental Data

Review of inferential statistics, hypothesis testing, Type I/Type II errors

Chapter 10: Experimental Design

Difference between one-way and factorial designs

Difference between main effects and interactions

Chapter 12: Analyzing Complex Experimental Designs

Greater depth: Analyzing designs discussed in Ch. 10, main effects/interactions

Chapter 13: Quasi-Experimental Designs

Good supplement to information in Lecture 13

Pretest-posttest designs

Time series designs

Longitudinal designs

Cross-sectional designs

Program evaluation

Threats to internal validity in quasi-experimental designs

Chapter 14: Single-Case Research

Single-case experimental designs v. case studies (definitions, pros/cons)