Fall 2005

Psychology 101: Research and Data Analysis in Psychology

This course covers both the design of experimental and non-experimental studies in psychological research and how the resulting data are analyzed. We will look at both descriptive and inferential procedures. Among the statistical procedures we will consider are those used to examine differences among means, evaluate correlations, and assess association in categorical observations.

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Lectures: I will give three one-hour lectures per week at 1:00 PM on Monday, Wednesday, and Friday in 100 GPB. On alternate Mondays the lecture will be replaced by a quiz.

Sections: You should be sure to enroll in a discussion section. These sections will review material covered in the previous week, go over the assigned problems, and illustrate the use of computer programs. The sections are also where you will work on the research project (see below), and your section leader will be responsible for advising you and grading your project. Sections are scheduled for Wednesday 3–5 (Lindsay), Thursday 9–11 (Virginia), 11–1 (Patrick), 1–3 (Virginia), and 3-5 (Patrick), and Friday 9–11 (Lindsay).

Texts: The primary text is *Statistical Reasoning in Psychology and Education* (fourth edition) by Bruce M. King and Edward W. Minium. We will also draw material from *Research in Psychology: Methods and Design* (fourth edition) by C. James Goodwin. The relevant chapters from Goodwin's text are bundled with the King and Minimum book at minimal additional cost. Specific readings from these books, keyed to the sequence of topics, are given below.

Research project: During the semester you will design, conduct, analyze, and write up a short study investigating some interesting psychological question. You will work in a group with two or three others from your discussion section to plan the study and collect your data (groups of three are optimal). You will analyze your data and write your own paper of about 10 pages discussing your results. The final report is due on the last day of class (9 December). Detailed instructions for the project and the paper, and intermediate deadlines will be provided later.

Examinations: Instead of one or two major midterms, we will have seven shorter biweekly quizzes—typically 8 to 12 multiple-choice or short answer questions and a problem of some sort. Each quiz covers material from approximately the past two weeks. They are not cumulative, except to the extent that later material inevitably builds on earlier techniques. These quizzes will be held during the lecture time on every other Monday (September 12 and 26, October 10 and 24, November 7 and 21, and December 5). No makeups for missed quizzes will be given, but only your top five

of the seven scores will be used to determine your grade. Although only five scores will be used, I strongly urge you take all the quizzes.

The final examination will be given in the University-assigned slot (exam group 12) on Friday, December 16, form 5 to 8p.m. The examination, which is mandatory, will be cumulative.

Grading: The scores for the three parts of the course will be combined numerically with approximately the following weightings: biweekly quizzes: 40% (after dropping the two lowest scores); research project: 30%; final examination 30% (these values may vary by ±5%). I do not have a particular formula to map these onto letter grades nor specific percentages of each grade. I expect that students who receive A's will give substantively correct answers to all parts of the exams and will write a good paper. Students who fall down in one or two places will receive a B, and so forth. In the past, these criteria have led to a median grade between B− and B, although I cannot guarantee that placement will be exactly the same. Note that because both the final examination and the paper come at the end of the course, a large proportion of your grade is determined after the last class.

Sequence of topics: The outline below lists the topics I plan to cover and their relationship to the reading. I have not divided them into lectures, nor assigned particular dates at this point. I may shift some topics around if it makes for a more natural or useful order.

1. Introduction [King & Minimum 1, Goodman 1]
   (a) Description and inference
   (b) Observations and designs
   (c) Types of research
   (d) Numbers and measurements [King & Minimum 2]

2. Descriptive statistics

   (a) Distributions and displays [King & Minimum 3, 4]
   - Classifications—bar charts and pie charts
   - Frequency distributions—histograms and frequency polygons
   - Cumulative distributions and percentiles

   (b) Moments
   - Central tendency [King & Minimum 5]
   - Variability [King & Minimum 6]
   - Standard scores

   (c) Association
   - Correlation [King & Minimum 8]. Note that we are skipping Chapter 7 at this point (I think it fits better later). You may need to glances at some parts of it in connection with Chapter 8–11.
   - Prediction [King & Minimum 9, 10]
   - Group differences

   (d) Interaction

3. Approaches to psychological research
   (a) Experimental [Goodman 5]
   - Manipulation and control

- Randomization

(b) Quasi-experimental designs [Goodman 10]
(c) Observational designs; surveys [Goodman 12]
(d) Summary of design types

4. Inference

(a) Mathematical basis
- Probability and probability distributions [King & Minimum 11]
- The normal distribution [King & Minimum 7]

(b) Conceptual basis—single-sample test of a mean
- Sampling and representativeness [King & Minimum 12]
- Decisions and errors [King & Minimum 13]
- Sampling variablity as a standard for effect; the t statistic
- Power and effect size [King & Minimum 14]
- Point estimates and confidence intervals [King & Minimum 18]
- Assumptions and nonparametric tests [King & Minimum 22, part only]

(c) Simple applications

i. Differences in mean [Goodman 6]
- Independent groups [King & Minimum 15]
- Paired scores [King & Minimum 16]

ii. Association
- Correlation coefficients [King & Minimum 17]

iii. Frequencies [King & Minimum 19]/ Note that this chapter is covered out of order.
- Single-sample tests
- Comparisons of several groups
- Association

(d) Extensions to more complex designs

i. Analysis of variance
- Multiple groups and compound hypotheses [King & Minimum 20]
- Factorial designs and interactions [King & Minimum 21]

ii. Multiple regression