PSY 203: Statistics for Psychology Syllabus

Prof. Justin Dainer-Best

Fall 2020

Course Number	Time	Location	Labs	Office Hours
PSY 203	M/W, 14:00-15:20	MPR/Remote	M, 16-18h; Th, 14-16h	Thursdays, 12:00-13:45

Stats Study Room	Time	Where	Course Assistant
	W, 18h-20h	Zoom	Eden
	T, 14h-16h	Zoom	Rachel

Pre-requisites: Introduction to Psychology or its equivalent; an intention to major in psychology or permission of instructor; and a passing score on part I of the quantitative diagnostic exam.

Overview

In this course, you will be introduced to the basics of statistics for psychology. We will extensively explore the use (and misuse) of statistics in a data-rich world—focusing largely on conceptualizing and interpreting statistical inferences within psychology. In this course, we will cover basic topics in statistics including: data visualization, measures of central tendency and variability, hypothesis testing, correlation and regression, t-tests, analysis of variance, and chi-squared tests. We will also talk about important ways in which statistics are used relating to the real world: thinking about polling, racial bias (and the historical misuse of statistics in this direction), and using statistics for improving outcomes for humankind.

Objectives

By the end of the semester you should. . .

- understand how we use the concepts of uncertainty and variability to draw inferences about samples
- grasp the logic, strengths, and limitations of the null hypothesis significance testing approach to using statistics to answer psychological questions
- understand the relationship among statistical significance, power, and effect size
- when presented with a research design (as you will be during your time as a major at Bard!), be able to
  - identify and conduct the correct statistical analysis in the R programming language and software package;
  - interpret the output of those tests in order to draw a conclusion about research questions; and
  - report the results of statistical analyses in colloquial language and in a manner appropriate for scientific publication
- have a greater understanding of the role of statistics in public discourse.

Instructor

The primary instructor for this course is Assistant Professor of Psychology Justin Dainer-Best (he/him/his).

There are also two course assistants, who are available to help in the lab sections and to provide tutoring twice a week: Rachel Boyd (she/her/hers) and Eden Rorabaugh (she/her/hers).

Lastly, Hadley Parum (they/them/theirs) is available for tutoring through the Bard Learning Commons. You may contact them directly by email to schedule tutoring.

Some FAQs about this course, and tips for success:

- *Is this course primarily about numbers, math, and computations?*

  There will be some computation. However, at heart, statistics are a tool for answering questions, and they are one of the most powerful tools in the psychologist's or computer scientist's toolbox. Some of what you will learn in this class will be based on mathematical knowledge, of course, and you should not be shy of that. Nonetheless, we will try not to lose sight of the fact that statistics in psychology are fundamentally a way of answering questions about the mind and behavior, and those questions should remain at the forefront of your mind throughout the course.

- *I want to be a _____ (see, e.g. therapist, social worker). Why do I need to take a class on statistics to major in psychology?*

  You would be surprised how important statistics are to those working in the helping professions! An ability to interpret statistics—and to recognize when they are being used correctly—is in fact a key component in learning which treatments are effective, or how to best serve a patient. Further, statistics are integrated into other things you will need to do at Bard (coursework, your senior project) and beyond (understanding journalism, elections and disease reporting, your finances, etc.).

- *Should I make use of the statistics study room or the professor's office hours? I'm already passing the class.*

  Yes! Office hours are not just about meeting with me after exams, and using the resources from the Learning Commons (including the study room and the course assistants) is strongly encouraged. Work with others! This might mean forming study groups with your classmates, as well.

  Former students have found it really useful to work on their homework with classmates or with tutors, so that they can ask questions as they go along. Work with your classmates, me, and assistants to see if you understand the material well enough to explain it to someone else.

- *What do I do if I don't understand something early on in the semester?*

  Stay up-to-date. The material is cumulative, so if a concept challenges you (especially early in the semester), address that right away by coming to office hours, speaking to a course assistant, or visiting the Learning Commons. Similarly, if you don't understand something during lab, ask for help from a classmate or from me, so that you don't get stuck not feeling like you understood anything. (We'll discuss this further in lab, too.)

- *Is it okay for me to use other resources besides the textbook, the slides, and my notes?*

  Yes, please use outside resources. There are a lot of stats resources on the web. Make use of them. You may wish to watch videos from (Khan Academy)[https://www.khanacademy.org/math/statistics-probability], for example. Further, here are a few additional textbooks that I've seen recommended (please note that these are **suggestions** and that I will not frequently be referring to them):

  - Field, A., Miles, J., & Field, Z. (2012). *Discovering statistics using R.* London, UK: Sage Publications.
  - Wheelan, C. (2014). *Naked statistics: Stripping the dread from the data.* New York: Norton.
  - Poldrack, R. (2018, 2019). *Statistical thinking for the 21st century.* Retrieved from https://statsthinking21.org/

- Navarro, D. J. (2011, 2016, 2019). *Learning statistics with R: A tutorial for psychology students and other beginners.* Version 0.6. Retrieved from https://learningstatisticswithr.com/
- Phillips, N. D. (2018). *YaRrr! The Pirate's Guide to R.* Retrieved from https://bookdown.org/ndphillips/YaRrr

The Navarro book is one that I used in last year's statistics course, and is free. Based on student feedback, I have switched *back* to using the Aron, Aron, & Coups book described below.

Additionally, there are *many* online resources available for learning and using R. I am happy to help you identify some that might work for you—this would be a great reason to come to my office hours, for example.

Materials

Textbook

Primary text: Aron, A., Aron, E., & Coups, E. J. (2012). *Statistics for psychology.* (5th ed.) Upper Saddle River, NJ: Pearson/Prentice-Hall. ISBN 0136010571.

We will be using the same textbook that has been used in previous years (barring last year), which I believe provides a strong theoretical background. I will provide explicit links between class and the textbook. However, the textbook *does not use R*, and as such we will diverge from it in some ways. The most recent version of the textbook is the **sixth** edition (Aron, Coups, & Aron; ISBN-13 9780205258154). However, I am comfortable with you using any recent edition. Do not buy the "workbook"; that is not what you need. Do consider searching for used copies. This should not be an expensive purchase.

You should complete each reading *in preparation for class*, as listed below on the schedule.

Course Website

Occasional supplementary readings may be posted on the course website. More importantly, most assignments will be turned in via Brightspace, and all lecture slides will be shared there or on the course website.

All assignments will be primarily based on **this document**. However, you should also log into the course's Brightspace site, where you will turn in assignments and take the course quizzes. Because of the need for retaining physical distance, all work done on paper will be turned in either by taking a photograph or by transposing your responses to an online format. No paper copies of any documents will be used in this course.

RStudio Cloud

For the labs and much of the examples in class, we will be using R, an open-source (and free) statistical programming language. Below, you will find instructions for installing R and RStudio on your personal computer (my recommendation). If you do not have access to a personal computer that will allow you to install this software, you have two options: (1) using lab computers—all of the computers in the RKC labs have R and RStudio installed, (2) you may choose to make a (free) account on https://rstudio.cloud/, which is a website that runs this software. You can save files, install packages, and download/upload your assignments.

Installing R and RStudio on your own computer

Most students will want to install R on their personal machines. Follow these instructions to do so.

1. Install R from https://cran.r-project.org/—it is available for Mac OS, Windows, and Linux. Choose the appropriate link, download, and install.

2. Install RStudio from https://www.rstudio.com/products/rstudio/download/—choose the free "RStudio Desktop" (all the way to the left). You can run R without RStudio, but I **strongly** recommend using RStudio (since that is what you'll be seeing for all examples).

You may also choose to install Jamovi from https://www.jamovi.org/download.html. I will *not* use Jamovi in class; however, Jamovi uses R as its back-end system and thereby may be useful to help you understand some basics of analysis; you may also use it in PSY 204: Research Methods. For more information on the relationship between Jamovi and R, please read about the 'jmv' package: https://www.jamovi.org/jmv/

Class Policies

Attendance

Because of the nature of the material, absences will likely incur a *de facto* penalty on exams because it is difficult to do well on tests without having attended class. We will move at a rapid pace; material that is missed due to absence will not be repeated in class or office hours. As importantly, late arrivals are disruptive to the class, especially in the current moment. Consistent patterns of lateness are unfair to other students. Please be on time.

If you are not feeling well, please do not come to class. Because of the need to remain home if you are ill, you may at **any point** choose to attend class remotely. Please let me know if you intend to do this (although I do not need to know why!), and I will make sure that you are able to attend. I have been encouraged to keep careful records of attendance in the interest of public health, but attendance will not directly impact your grade.

If you are attending class (or lab) online, I still expect to begin class on-time; please log in at the beginning of class.

Masks

Each of us shares responsibility for the health and safety of all in the classroom. I expect you to maintain six feet of distance from one another, to cover your nose and mouth with a cloth mask throughout class, and to stay home when you feel ill. These directives are consistent with Bard's policies and with the CDC guidelines. In the classroom, if you are not following these provisions (e.g., remove your mask, or intrude on others' space unnecessarily), you will be reminded of these directives and then asked to leave.

Accommodations & Accessibility

Bard College is committed to providing equal access to all students. If you anticipate issues related to the format or requirements of this course, please contact me so that we can arrange to discuss. I would like us to discuss ways to ensure your full participation in the course. Together we can plan how best to support your learning and coordinate your accommodations. Students who have already been approved to receive academic accommodations through disability services should share their accommodation letter with me and make arrangements to meet as soon as possible.

If you have a learning difference or disability that may relate to your ability to fully participate in this class, but have not yet met with the Disability Support Coordinator at Bard, you can contact their office through https://www.bard.edu/accessibility/students/; the Coordinator will confidentially discuss the process to establish reasonable accommodations. Please note that accommodations are not retroactive, and thus you should begin this process as soon as possible if you believe you will need them.

There are some packages available for R which make it more accessible to users with visual impairments; you can read more about them here and more about accessibility features in Rstudio here. Wherever possible, I will aim to include alt-text for images and optimize

Diversity, Equity, & Inclusion

It is important to me that this course provides an open and supportive learning environment for all students. I invite you to speak with me if you have concerns or questions regarding issues of belonging, safety, or equity

in the classroom. I want our discussions to be respectful of all students. If I am not helping the classroom to feel like an inclusive environment, I invite you to provide me with [anonymous] feedback.

Plagiarism and Academic Integrity

I expect you to be familiar with what plagiarism is and is not. You may not present someone else's work as your own without proper citation. You may not copy someone else's work. You may not simply reword text from another source without giving credit. Please cite others' work where relevant, and use your own writing. If you are not sure about the definition of plagiarism, or whether something constitutes plagiarism, please consult with me or with someone at Bard's Learning Commons. Students caught plagiarizing will be reported to the Academic Judiciary Board, will get no credit for the assignment, and may fail the course.

However, please note that I *do* encourage you to work with your classmates during this course. While quizzes, the solo project, and the written paper are to be completed independently, other assignments should be worked on collaboratively. Homework assignments may be worked on with peers, **provided that you credit your study group**. The group project and lab assignments should always be worked on with classmates. Study groups are an excellent way to learn material. However, you should take care to ensure that you can respond to the questions independently.

I operate from the standpoint that you are interested in learning this material, and are doing your best to operate with integrity.

Cell phones and laptops

Before class, you should silence your cell phone, and you should not be on your phone during class except when asked to be (e.g., to respond to a poll). I do not recommend taking notes on your phone unless you do not have notebook paper. In our M/W classes, I recommend taking notes on paper wherever possible. If you text or access materials unrelated to class during our class time, you are mentally absent from class.

In lab sessions, we will be using computers. I encourage you to turn off notifications / turn on Do Not Disturb whenever possible. Browsing unrelated materials is distracting to you and also to your classmates.

Late Assignments

The homework assignments, class reports, lab projects, and final paper can be turned in **within two days** of their due dates without penalty. For example, if a homework assignment is due before class on a Wednesday, it may be turned in by Friday at midnight without penalty. Assignments may still be turned in after their late date. However, such assignments are considered "missing" (see section "Grading" below). If your work is consistently turned in late, this also may impact your grade unless you discuss this lateness with me.

Quizzes must be completed during the window in which they are assigned. You do not need to complete every quiz in order to get full points for the quizzes. That said, repeatedly missing quizzes will impact your grade.

Assignments

Homework

Homework for each chapter will be due online after we complete a particular topic. You may choose to write them by hand and photograph the final document, to combine hand-drawn and digital pages, or to type all responses.

My recommendation is that you learn to use R Markdown and turn in the output from R Markdown files. Learn more about R Markdown here: https://rmarkdown.rstudio.com/articles_intro.html

Homework assignments will be scored based on completion and whether they are on-time; see below for more information.

Class Report

With every homework assignment, you will also turn in a class report, in which you respond to the following questions

- Summarize what you believe to be the most important points (and, where relevant, equations) relating to the concepts discussed since the last report

- Identify any questions you still have about these topics/concepts—explain what the concept is, and why you still have questions

- Comment on the homework assignment you have turned in—how did you work on it, and where did you succeed or struggle?

- Identify what is *exciting* or *interesting* about the material, and why

- **Apply the statistical methods we have been discussing to a psychological question** *that you develop*

  For example, you might give an example of a psychological experiment where a *z*-test (see the schedule, below) could be used to draw conclusions about the results.

You may choose to turn in text documents, but there is also a template available here. (Right click on this file and click Save File As. Make sure the file extension is .Rmd and not .txt.)

Following the first class report, I will also provide examples of "satisfactory," "exemplary", and "insufficient" class reports.

Brightspace quizzes

There will be quizzes on Brightspace for most topics. Each quiz counts as up to 5 points; your top 10 quizzes will be summed to create the final quiz score. Quizzes must be taken by midnight the day after the topic is covered that has a quiz in the schedule below. (I will send out a reminder email when the quiz is available; you should take the quiz when you get the email, so you do not forget.)

All quizzes are open-book and comprised of questions randomly selected from a larger set of questions (so each student will have a different quiz). You may not collaborate or ask for help on these quizzes (see Plagiarism, above).

Solo Project

The solo project is a lab-based project and is open everything-but-another-person (you may use notes, a search engine, R Help, your textbook, etc.). You will be assigned the project during the lab period and complete it over the course of that period and the following week. This project is designed to allow you to demonstrate that you understand how to use the code we learn in lab, and to apply it to the questions asked in class.

The goals of this and the group project, below, are as follows:

- *Help you to practice the skills learned in lab.* While there will be weekly lab assignments, the lab projects give you an opportunity to explore the skills you are developing, write code, and analyze real data.

- *Prepare you for research classes and senior project.* Many students take advanced methodology courses in the psychology program and complete research projects for their senior project. This experience helps prepare you for analyzing data.

- *Introduce you to the experience of adapting code.* Most questions that you will ask in these projects will be corollaries of those asked in preceding labs. Your project will thus involve editing and reusing techniques you have already learned.

Further details will be provided with the assignment.

Group project

In your group project, you will perform a data analysis on *real data*, using the skills you've developed in the labs. This group project is a semester-summarizing version of the solo project—you will develop research questions, create visualizations, carry out analyses, and produce a final document that reports all of them. Further details will be provided later in the semester.

Final paper

In your final paper, you will analyze the data analysis reported in a published psychology journal article. This assignment has three primary goals.

- *Help you to be a consumer.* Class and exams provide the opportunity to show you understand and can use statistics. In reading published articles, it is crucial to understand and evaluate how the conclusions were derived, and to evaluate independently whether you accept the claims. In this assignment, you will be an active reader, and provide your analysis of the report of the data analysis and presentation.

- *Simulate the peer review process.* Peer review is the primary mechanism by which papers in psychology are published. It is the 'gatekeeper' of the academic world, and aims to ensure that published work meets high standards. Typically, after a paper is submitted, an editor solicits expert reviews that assess the paper's strengths and weaknesses. This assignment will give you a chance to be that expert.

- *Prepare you for moderation.* Psychology moderators write a paper that summarizes and evaluates a psychology journal article. Part of your analysis should focus on the appropriateness of the analyses given: (1) the hypothesis being tested, (2) the study design, and (3) the features of the data set. This assignment will thus prepare you for Moderation Saturday.

Your analysis will focus on the results section. In 3–4 pages, you should:

- Briefly (1–2 paragraphs) summarize the research goals and method. Assume the reader is a psychologist unfamiliar with the paper.

- Summarize the analyses conducted. Be sure to state the null hypothesis (or hypotheses) even if the paper does not do so explicitly.

- The bulk of the paper will be spent on your critique. What you choose to focus on is up to you, but some suggested directions are:

    - **Analyses**. Were the analyses appropriate—given the data, would you have conducted the same or different analyses? Why or why not?

    - **Presentation**. Was the presentation of the results clear? Could the paper have benefited from other—or different—tables or figures that would have made the findings more clear? Were any figures or tables accurate representations of the findings?

    - **Inferences**. Are the conclusions drawn from the analyses reasonable?

Other Guidelines

- The paper should be 3–4 double-spaced pages, and clearly written. You can organize your argument however you wish, but there should be a logical order to the paper. Be sure to include an introduction and conclusion to your main argument.

- Citations should be in APA format, and you should include a Reference list. You must work independently on the paper, but are free to consult with me. You may refer to any sources that you find useful (be sure to cite them).

- In the past, the strongest papers have focused on two or three areas in the analysis section, and fully developed and explained them. One "danger zone" is the temptation to analyze research methods rather than data analysis and statistics. Focus on the stats—you'll have plenty of time to think about methods next semester in PSY 204.

Grades

Assignment	Points
Homework	20
Class Reports	30
Quizzes	30
Solo Project	20
Group Project	40
Final Paper	10
Total	**150**

Your grades in this course will come from the assignments described above: a solo **lab project**, a **group project**, regular **homework** assignments and **class reports**, **online quizzes**, and a **final paper**.

Grade	Range
A-range	135-150
B-range	120-134
C-range	105-119
D-range	90-104
F	below 90

There are a lot of assignments in this course—this means (a) that there is a lot of room to succeed and learn the material, and (b) that there are many things for you to keep track of. (Don't forget the schedule!)

However, my role as your professor is to help you learn to use the skills of statistical analysis—not to give you grades. That means that most students can get a B in this course by putting in the work to sufficiently complete all assignments, mostly on-time. (Plus and minus grades will be assigned at the top/bottom of each grade range.)

How does this work?:

Missed assignments will not receive full scores.

As described in the Section on Late Assignments above, late assignments can be turned in up to two days late without penalty. (Think of the due date as a "due date window.") **Missed assignments** are those that are not turned in by the late due date. These assignments will by definition receive below the full score, as detailed below.

Homework assignments are self-graded.

I will collect your homework assignments, and you will receive credit for whether they are completed. You will score your own homework; I will provide detailed correct answers. This sort of self-assessment is important in fully understanding the material. I will frequently choose one question to review, and will provide class-wide feedback on this material. Answering questions wrong will not result in a lower score, but I *do* expect you to make honest attempts at all questions. Homework will receive half-credit if missing, and no credit at all if not turned in.

Class reports are graded on a 3-point scale.

All class reports will receive 2 points (sufficient) if turned in on-time and complete. Missing class reports, or those without all required sections, will receive 1 point (incomplete). To receive 3 points, class reports must be **thoughtful**, provide multiple **novel connections to psychological research**, and be turned in on-time.

Lab assignments are graded through RStudio, your group work, and through conversation with the instructor.

All lab assignments are designed to teach you something about using R and statistics. You will work in a small group throughout the semester, and will solve problems on your own and in that group. You will have meetings during each lab class with the professor, where you will ask questions, show your code, and have the opportunity to demonstrate mastery of the material. The point of the labs is to give you an opportunity to apply the statistical concepts to data.

You will also correct one another's assignments—reading through another student's lab work and making suggestions.

Quizzes are graded automatically through Brightspace

Quizzes are scored at 5 points each. The highest 12 quizzes will be included in your final grade, for a total of 30 possible points: $\frac{5 \times 12}{2}$.

As there are 16 quizzes throughout the semester, you can miss quizzes without impacting your grade.

The solo lab project is graded on a 20-point scale.

Completion of all of the parts of the project will result in a score of 16. Additional points will be awarded for students who demonstrate excellence in their use of code and visualization.

The group project is graded collaboratively.

The group project is the culmination of several individuals' work. You will, when it is completed, each complete a rubric for grading yourselves. I will make use of this rubric in assigning final points for each group. Groups who complete all of the requirements and submit the project on-time should receive 32 points.

The final paper is graded on a 10-point scale.

Full points will be awarded for papers turned in on-time and which fulfill all of the requirements described above. This paper is intended to encourage you to think deeply about the statistics underlying a research article.

Schedule

The schedule may change over the course of the semester. Changes to assignment dates will be announced via email and also changed online. You are responsible for keeping up with the readings, showing up to class prepared, and turning in assignments on-time.

Chapters refer to the textbook.

Day	Date	Topic	Reading	Due
Monday	Aug 31	Intro		
Lab	*Aug 31/Sep 3*	*Intro to R*	*https://tidylsr.djnavarro.net/r-start.html#first-steps*	
Wednesday	Sep 02	Statistical Concepts	Ch. 1	Quiz 1
Monday	Sep 07	Central Tendency and Variability	Ch. 2	Quiz 2
Lab	*Sep 7/10*	*Practicing with R*		
Wednesday	Sep 09	z-scores and probability	Ch. 3	Quiz 3
Monday	Sep 14	Estimating unknown quantities from a sample		Quiz 4
Lab	*Sep 14/17*	*Visual Displays of Information*		
Wednesday	Sep 16	Hypothesis Testing	Ch. 4	
Monday	Sep 21	Hypothesis Testing		Quiz 5
Lab	*Sep 21/24*	*Hypothesis testing*		

Day	Date	Topic	Reading	Due
Wednesday	Sep 23	Testing Hypotheses with Means of Samples	Ch. 5	Quiz 6
Monday	Sep 28	Visualizing Data (with Drew Stanley)		
Lab	*Sep 28/Oct 1*	*t-test for a single sample*	*Ch. 7*	
Wednesday	Sep 30	t-test for a single sample		Quiz 7
Monday	Oct 05	t-test for independent means	Ch. 8	
Lab	*Oct 5/8*	*Visualizations II*		
Wednesday	Oct 07	t-test for independent means		Quiz 8
Monday	Oct 12	t-test for dependent means		Quiz 9
Lab	*Oct 12/15*	*t-test for dependent and independent means*		
Wednesday	Oct 14	Type I and Type II errors; Effect Size	Ch. 6	
Monday	Oct 19	Statistical Power		Quiz 10
Lab	*Oct 19/22*	*Solo project*		
Wednesday	Oct 21	Confidence Intervals and Uncertainty		Quiz 11
Monday	Oct 26	One-way ANOVA	Ch. 9	
Lab	*Oct 26/29*	*One-way ANOVA*		*Solo project*
Wednesday	Oct 28	One-way ANOVA		Quiz 12
Monday	Nov 02	Correlation and Regression	Ch. 11	
Lab	*Nov 2/5*	*Correlation*		
Wednesday	Nov 04	Correlation and Regression	Ch. 12	Quiz 13
Monday	Nov 09	Factorial ANOVA and Interactions	Ch. 10	
Lab	*Nov 9/12*	*Academic Writing & Plagiarism*		
Wednesday	Nov 11	Factorial ANOVA and Interactions		Quiz 14
Monday	Nov 16	Chi Square	Ch. 13	Quiz 15
Lab	*Nov 16/19*	*Chi Square*		
Wednesday	Nov 18	When assumptions fail	Ch. 14	
Monday	Nov 30	Bayesian Statistics		
Lab	*Nov 30/Dec 3*	*Project Workday*		
Wednesday	Dec 02	Bayesian Statistics		Quiz 16
Monday	Dec 07	Applications		
Lab	*Dec 7/10*	*Asking questions and knitting documents*		

(continued)

Day	Date	Topic	Reading	Due
Wednesday	Dec 09	Advising Day		
Friday	Dec 11			Final papers
Wednesday	Dec 14			Final projects