Faculty of Health
Department of Psychology
PSYC 2021C: STATISTICAL METHODS I
In-Person Lecture on Mondays 8:30am-11:30am
2023 Winter
Curtis Lecture Halls E

Instructor and T.A. Information

Instructor	**Cathy (Xijuan) Zhang**
Email	xijuan@yorku.ca
Online and In-Person Office Hour	Monday 12:30pm-1:30pm Behavioral Science Building Room 367

TA	**TBA**
Email	TBA
Office Hour	TBA

Course Prerequisite(s): Course prerequisites are strictly enforced

- HH/PSYC 1010 6.00 (Introduction to Psychology).

Course Credit Exclusions
Please refer to York Courses Website for a listing of any course credit exclusions.

Course website: eClass
All course materials will be available on the course eClass site.

Course Description
This course is usually the first course in statistics that most psychology (and other) majors take in university. This class will introduce you to the basic principles underlying statistical analyses in psychology and other social sciences areas. It will also prepare you for future statistics classes which will focus on more advanced techniques. More specifically, this course will introduce you to the type of variables utilized in psychology, two-variable correlation, and comparing two independent or paired-sample means. Null hypothesis significance testing will be introduced, however the focus will be on understanding relationships among variables. Data analysis using statistical software will be carried out with the open-source software R (www.r-project.org).

Program Learning Outcomes
Upon completion of this course, students should be able to:

1. Compute descriptive statistics and inferential statistics.
2. Interpret and report the results of descriptive statistics and inferential statistics.
3. Distinguish between the role of descriptive statistics and inferential statistics.
4. Run simple analyses using the computer programming language *R.*

Topics Covered

- Defining Key Statistical Terms
- Frequency Distributions
- Central Tendency
- Variability
- z-scores/Normal Distribution
- Probability
- Sampling Distribution
- Confidence Intervals
- Power
- Effect Size
- Hypothesis Testing
- Pearson's Correlation
- Chi-square: Goodness of Fit
- Chi-square: Test of Independence
- One-sample *t*-test
- Introduce independent and dependent designs

**Effect size is included as part of all inferential statistics covered in this course.*

Course Notes and Textbooks

Required lecture notes will be posted on eClass.

Required textbook: Navarro (2018): Learning statistics with R: A tutorial for psychology students and other beginners.

- It is an open source textbook that can be downloaded using the link https://open.umn.edu/opentextbooks/textbooks/559

Required youtube videos are at the end of the syllabus.

Recommended youtube videos will also be posted on eClass.

Course Requirements and Assessment:

Final grades will be comprised of marks earned on:

1) Exams (Midterm: 25%; Final Exam: 35%)
We will have in-person midterm and final exams. The exams will consist of a combination of multiple-choice, filling-in-blank, and short-answer questions.
The midterm will be held in class on Oct 16. It covers all materials taught before the midterm.
The final exam will be scheduled by the university. The final exam will cover all course materials covered with more emphasis on the second half of the course.

2) In-class participation (10%)
During lectures, I will have iclickers questions. The iclicker questions will be marked based on participation (50%) and correctness (50%). Your three lowest weekly marks will not be counted. In other words, if you miss up to three weeks, you can still get full marks for the in-class participation.

2) Online quizzes (2 x 5%)
There will be two online quizzes that help you keep up with the course materials. Each online quiz will be 30 mins long, consisting of 8 questions, a combination of multiple choice or short answer questions.
Quiz Dates:
Quiz #1: Sept 25
Quiz #2: Nov 20

2) Assignments (3 x 10%)
There will be four assignments for the course that will require you to analyze data (including using R) and short answer questions. You will be given the assignments one week before they are due.
Assignment Due Dates:
Assignment #1: Oct 2
Assignment #2: Nov 6
Assignment #3: Nov 27
You will be deducted 10% (of the 15% allotted to each assignment; i.e., 1.5% of your final grade) for each day (not including weekends) that your assignment is late.

3) Bonus Assignment (3%)
You can earn up to 3% bonus if you write the bonus assignment posted on Dec 4.

Grading as per Senate Policy
The grading scheme for the course conforms to the 9-point grading system used in undergraduate programs at York (e.g., A+ = 9, A = 8, B+ = 7, C+ = 5, etc.). Assignments and tests* will bear either a letter grade designation or a corresponding number grade (e.g. A+ = 90 to 100, A = 80 to 89, B+ = 75 to 79, etc.)
For a full description of York grading system see the York University Undergraduate Calendar - Grading Scheme for 2023-24

Missed Tests/Midterm Exams/Late Assignment
You can still hand in the assignment before the answer key released. You will lose 10% of the mark for each late day. Once the answer key is released, you will not be able to submit the assignment for grades.
If you miss the midterm, then the final exam will count 50% of your grade.

Add/Drop Deadlines
For a list of all important dates please refer to: https://registrar.yorku.ca/enrol/dates/2023-2024/fall-winter

Last date to add a course without permission of instructor	Sept 20
Last date to add a course with permission of instructor	Sept 28
Last date to drop course without receiving a grade	Nov 8

Course Withdrawal Period (withdraw from course and receive a "W" on transcript – see Add and Drop Deadline Information below)	Nov 13-Dec 7

Add and Drop Deadline Information

There are deadlines for adding and dropping courses, both academic and financial. Since, for the most part, the dates are **different**, be sure to read the information carefully so that you understand the differences between the sessional dates below and the Refund Tables.

You are strongly advised to pay close attention to the "Last date to enrol without permission of course instructor" deadlines. These deadlines represent the last date students have unrestricted access to the registration and enrolment system.

After that date, you must contact the professor/department offering the course to arrange permission.

You can drop courses using the registration and enrolment system up until the last date to drop a course without receiving a grade (drop deadline).

You may withdraw from a course using the registration and enrolment system after the drop deadline until the last day of class for the term associated with the course. When you withdraw from a course, the course remains on your transcript without a grade and is notated as 'W'. The withdrawal will not affect your grade point average or count towards the credits required for your degree.

Electronic Device Policy

This course will be delivered in an online format and therefore electronic devices (e.g., tablets, laptops) are permitted during class time for course-related purposes. It is expected that you would complete tests/exams in a manner that does not require consulting an unauthorised source during an examination unless the tests/exams are open-book.

Academic Integrity for Students

York University takes academic integrity very seriously; please familiarize yourself with Information about the Senate Policy on Academic Honesty.

It is recommended that you review Academic Integrity by completing the Academic Integrity Tutorial and Academic Honesty Quiz

Test Banks

The offering for sale of, buying of, and attempting to sell or buy test banks (banks of test questions and/or answers), or any course specific test questions/answers is not permitted in the Faculty of Health. Any student found to be doing this may be considered to have breached the Senate Policy on Academic Honesty. In particular, buying and attempting to sell banks of test questions and/or answers may be considered as "Cheating in an attempt to gain an improper advantage in an academic evaluation" (article 2.1.1 from the Senate Policy) and/or "encouraging, enabling or causing others" (article 2.1.10 from the Senate Policy) to cheat.

Academic Accommodation for Students with Disabilities

While all individuals are expected to satisfy the requirements of their program of study and to aspire to do so at a level of excellence, the university recognizes that persons with disabilities may require reasonable accommodation to enable them to do so. The university encourages students with disabilities to register with Student Accessibility Services (SAS) to discuss their accommodation needs as early as possible in the term to establish the recommended academic accommodations that will be communicated to Course Directors as necessary. Please let me know as early as possible in the term if you anticipate requiring academic accommodation so that we can discuss how to consider your accommodation needs within the context of this course. https://accessibility.students.yorku.ca/

Excerpt from Senate Policy on Academic Accommodation for Students with Disabilities

1. Pursuant to its commitment to sustaining an inclusive, equitable community in which all members are treated with respect and dignity, and consistent with applicable accessibility legislation, York University shall make reasonable and appropriate accommodations in order to promote the ability of students with disabilities to fulfill the academic requirements of their programs. This policy aims to eliminate systemic barriers to participation in academic activities by students with disabilities.

All students are expected to satisfy the essential learning outcomes of courses. Accommodations shall be consistent with, support and preserve the academic integrity of the curriculum and the academic standards of courses and programs. For further information please refer to: York University Academic Accommodation for Students with Disabilities Policy.

Course Materials Copyright Information

These course materials are designed for use as part of the PSYC 2021C course at York University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as book chapters, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this material for distribution (e.g. uploading material to a commercial third-party website) may lead to a violation of Copyright law. Intellectual Property Rights Statement.

Course Schedule

The schedule is subject to change depending on the pace of the lectures.

Day	Topic	Readings/Videos	Notes
Sept 11	Introduction to statistics Review of Basic Algebra	Syllabus Videos: 1) Fractions https://www.youtube.com/watch?v=CA9XLJpQp3c https://www.youtube.com/watch?v=AtBUQH8Tkqc https://www.youtube.com/watch?v=qmfXyR7Z6Lk https://www.youtube.com/watch?v=4lkq3DgvmJo https://www.youtube.com/watch?v=5juto2ze8Lg 2) Ratio/Proportion https://www.youtube.com/watch?v=HpdMJaKaXXc https://www.youtube.com/watch?v=USmit5zUGas 3) Percentage https://www.youtube.com/watch?v=JeVSmq1Nrpw https://www.youtube.com/watch?v=Lvr2YsxG10o https://www.youtube.com/watch?v=5z568fLBQyQ https://www.youtube.com/watch?v=-gB1y-PMWfs 4) Order of Operations https://www.youtube.com/watch?v=dAgfnK528RA https://www.youtube.com/watch?v=ClYdw4d4OmA https://www.youtube.com/watch?v=piIcRV2dx7E 5) Factorial https://www.youtube.com/watch?v=eXcJOgNPYJE 6) Functions: https://www.youtube.com/watch?v=52tpYl2tTqk https://www.youtube.com/watch?v=kvGsIo1TmsM 7) Solve equations https://www.youtube.com/watch?v=l3XzepN03KQ https://www.youtube.com/watch?v=Qyd_v3DGzTM https://www.youtube.com/watch?v=jWpiMu5LNdg https://www.youtube.com/watch?v=f15zA0PhSek https://www.youtube.com/watch?v=iimpwYBiKNg 8) Sigma Notation for Sums https://www.youtube.com/watch?v=lQZY4pD8X6I https://www.youtube.com/watch?v=5jwXThH6fg4 https://www.youtube.com/watch?v=R019a93NrmY https://www.youtube.com/watch?v=luSh3hz_b18	Welcome!
Sept 18	Introduction to statistics Research design Introduction to *R*	Textbook Readings: • Ch.1 (all) • Ch.2 (2.0-2.6) • Ch.3 (3.0-3.4) Videos: 1) Introduction to Statistics https://www.youtube.com/watch?v=zouPoc49xbk https://www.youtube.com/watch?v=sxQaBpKfDRk 2) Population vs Sample https://www.youtube.com/watch?v=jPPF2xSEyKU https://www.youtube.com/watch?v=VPM84_yfx5Q	Assignment 1 Posted

		https://www.youtube.com/watch?v=MXaJ7sa7q-8	
Sept 25	Descriptive statistics Introduction to *R*	Textbook Readings: • Ch.5 (5.0-5.2 [omit 5.1.6, 5.2.3 and 5.2.6]; 5.4; 5.7 [omit 5.7.6]; 5.9) • Ignore the notations for the standard deviation formula on page 128; please refer to my lecture notes for these equations. • Ch.3 (3.5-3.12) Videos: 1) Central Tendency and Variability https://www.youtube.com/watch?v=B1HEzNTGeZ4 https://www.youtube.com/watch?v=kn83BA7cRNM https://www.youtube.com/watch?v=E4HAYd0QnRc https://www.youtube.com/watch?v=R4yfNi_8Kqw https://www.youtube.com/watch?v=vcbMinm_1Q8 https://www.youtube.com/watch?v=sK0RY-Qkug4 2) *z*-score https://www.youtube.com/watch?v=5S-Zfa-vOXs 3) Correlation https://www.youtube.com/watch?v=-Y-M9aD_ccQ https://www.youtube.com/watch?v=ROpbdO-gRUo	Quiz 1
Oct 2	Probability Introduction to *R*	Textbook Readings: • Ch.9 (9.0-9.3) • Ch.4 (4.0-4.6, 4.12) Videos: 1) Permutation and Combination https://www.youtube.com/watch?v=eoxbgUIYhHo https://www.youtube.com/watch?v=DROZVHObeko https://www.youtube.com/watch?v=iKy-d5_erhI 2) Experiemnt, Sample Space and Event https://www.youtube.com/watch?v=XhVBJSvhPys https://www.youtube.com/watch?v=5oI8-iQqPAI 3) Rules of Probabiilty https://www.youtube.com/watch?v=LS-_ihDKr2M https://www.youtube.com/watch?v=f7agTv9nA5k https://www.youtube.com/watch?v=OyddY7DlV58 3) Conditional Probability and Bayes' Theorem: https://www.youtube.com/watch?v=bgCMjHzXTXs https://www.youtube.com/watch?v=XQoLVl31ZfQ https://www.youtube.com/watch?v=U_85TaXbeIo https://www.youtube.com/watch?v=HZGCoVF3YvM • Warning: the last video is hard. Topics unique to this video may appear on the assignment but not on the exams. 4)Frequentist vs Bayesian https://www.youtube.com/watch?v=GEFxFVESQXc	Assignment 1 Due
Oct 9 (No Class)	Reading Break	Extra Office Hour TBA.	
Oct 16	**Midterm**		
Oct 23	Probability Introduction to *R*	Textbook Readings: • Ch.9 (9.4-9.7) • Ch.4 (4.8-4.11) Videos:	Assignment 2 Posted

		1) Random Variables https://www.youtube.com/watch?v=3v9w79NhsfI https://www.youtube.com/watch?v=vfqPpai_9jI https://www.youtube.com/watch?v=dOr0NKyD31Q https://www.youtube.com/watch?v=j__Kredt7vY 2) Binomial Distribution https://www.youtube.com/watch?v=nRuQAtajJYk https://www.youtube.com/watch?v=WR0nMTr6uOo https://www.youtube.com/watch?v=8idr1WZ1A7Q • Warning: the last video is hard. Topics unique to this video may appear on the assignment but not on the exams.	
Oct 30	Estimating from a sample	Textbook Readings: • Ch.9 (9.5-9.7) • Ch.10 (10.0-10.3) Videos: 1) Normal Distribution https://www.youtube.com/watch?v=mtbJbDwqWLE https://www.youtube.com/watch?v=iYiOVISWXS4 2) Law of Large Numbers: https://www.youtube.com/watch?v=VpuN8vCQ--M 3) Central Limit Theorem and Sampling Distrbution of the Mean https://www.youtube.com/watch?v=z0Ry_3_qhDw https://www.youtube.com/watch?v=JNm3M9cqWyc https://www.youtube.com/watch?v=NYd6wzYkQIM https://www.youtube.com/watch?v=J1twbrHel3o https://www.youtube.com/watch?v=0ZstEh_8bYc	
Nov 6	Estimating from a sample Hypothesis testing	Textbook Readings: • Ch.10 (10.4-10.6) • Note: Ignore the formula for sample variance on page 318; ignore the table on page 319 • Ch.11 (11.0-11.3) Videos: 1) Sampling Distributon of Proportion: https://www.youtube.com/watch?v=fuGwbG9_W1c 1) Point Estimation https://www.youtube.com/watch?v=4v41z3HwLaM 2) Interval Estimation and Confidence Interval https://youtu.be/9GtaIHFuEZU https://www.youtube.com/watch?v=yDEvXB6ApWc 3) Types of Hypothesis and *p*-value https://www.youtube.com/watch?v=KS6KEWaoOOE https://www.youtube.com/watch?v=bf3egy7TQ2Q https://www.youtube.com/watch?v=PPD8lER8ju4	Assignment 2 Due
Nov 13	Hypothesis testing	Textbook Readings: • Ch.11 (11.4-11.10) • Wikipage on misuse of *p*-values: https://en.wikipedia.org/wiki/Misuse_of_p-values	Assignment 3 Posted

		Videos: 1) *p*-hacking https://www.youtube.com/watch?v=0Rnq1NpHdmw https://www.youtube.com/watch?v=Gx0fAjNHb1M 2) Type I, Type II Error and Power https://www.youtube.com/watch?v=6_Cuz0QqRWc https://www.youtube.com/watch?v=Hdbbx7DIweQ https://www.youtube.com/watch?v=WWagtGT1zH4	
Nov 20	Comparing means	Textbook Readings: • Ch.13 (13.0-13.5) Videos: 1) One-Sample z-test and t-test: https://www.youtube.com/watch?v=5ABpqVSx33I https://www.youtube.com/watch?v=HoqzIR8xj4s https://www.youtube.com/watch?v=tsPv-ffN-0M https://www.youtube.com/watch?v=NQWZefn41VY https://www.youtube.com/watch?v=dDsKP7wVpzM 2) Paired-Samples t-test: https://www.youtube.com/watch?v=AGh66ZPpOSQ https://www.youtube.com/watch?v=S-BmFzUTDxQ	Quiz 2
Nov 27	Comparing means Categorical data analysis	Textbook Readings: • Ch.13 (13.6-13.8, 13.11) • Ch.12 (12.0-12.6, 12.10) Videos: 1) Chi-Square Distribution: https://www.youtube.com/watch?v=dXB3cUGnaxQ 2) Pearson Chi-Square Test https://www.youtube.com/watch?v=2QeDRsxSF9M https://www.youtube.com/watch?v=hpWdDmgsIRE	Assignment 3 Due
Dec 4	Categorical data analysis		Bonus Assignment Posted