82:350 – ADVANCED STATISTICS AND RESEARCH METHODS IN PSYCHOLOGY

Fall Semester: September 4th – December 5th 2024
Lectures: Mon and Wed: 3:40pm – 5:00pm   BB 1-53
Labs: Thurs: 1:40pm – 4:30pm   G-20C

Instructor: Nicholas Watier, PhD
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Office hours: I am available by appointment

Course Information: Moodle for grades, assignment information, lecture slides, and lab manuals
                         (moodle.brandonu.ca; key: 82350)

Course Description (from the course calendar): This course will provide an introduction to advanced topics in the statistical analysis of correlational and experimental research in psychology. Topics will include research design, factorial and repeated analysis of variance, multiple regression, and nonparametric tests. Labs will require students to acquire skills in the use of statistical analysis software, and to conduct, analyze and report a small group research project. This course is required of Bachelor of Arts and Bachelor of Science students before entering the Honours program in Psychology, and is normally taken in the third year of their program.

Course Description (from the perspective of the instructor): This course aims to prepare students for completing an honours thesis. The first third of the course will focus on key concepts in experimental designs, statistical inference, null hypothesis testing, and techniques surrounding analyzing data from experimental designs, with an emphasis on analysis of variance. While there will be overlap from the content of 82:250 and 82:251, the material will be presented in more depth, so as to develop mastery in statistics and research design. The second third of the course will focus on writing a research proposal. Lectures will focus on developing a research question, searching for journal articles, designing an experiment from the ground-up, outlining the components of an introduction and methods section, and practicing effective writing strategies. The final third of the course explores correlational designs and associated analyses, including regression models. Throughout the course, an appreciation for mathematical formalism and conceptual understanding will be fostered during the lectures and in the laboratory. **You are encouraged to ask questions and speculate wildly**. Use this class as an opportunity to challenge yourself intellectually in a supportive and collaborative environment.

Prerequisite: 82:251

Delivery: Lectures will be conducted in BB 1-53, and the labs will be conducted in G-20C, which is located in the basement of the Brodie Building. The labs will involve learning how to use SPSS, which is a popular statistical software package. While you are expected to attend the labs, I will post weekly lab instructional videos and manuals on Moodle as a fail-safe. If you cannot attend a lab, you can watch the video, read the manual, and tryout the analysis on your own.

Computer Software: You will have access to the university license for SPSS on your home computer. IT services has created a guide for installing SPSS on Microsoft Teams. You should be automatically added to the Team, but if not the code to join the Team is m9nhmkc. Once joined, you will have access to the guide and files needed to install SPSS.

The university only allows 25 users to access SPSS concurrently. Consequently, while it is unlikely, you may occasionally be unable to access SPSS. If you want to ensure you have access to the program at all times, the following websites allow students to rent SPSS for 6 or 12 month periods: https://studentdiscounts.com/ and https://onthehub.com/. The cost is approximately $70 for a 6-month rental. Each site has various options to rent SPSS. **You will need the Standard - GradPack option for this course.** You can rent earlier versions of SPSS if your computer does not meet the system requirements for the most recent version.

You will also be required to download and install G*Power, which is freely available and can downloaded here: https://www.psychologie.hhu.de/arbeitsgruppen/allgemeine-psychologie-und-arbeitspsychologie/gpower.html

Optional Textbook: A textbook is not required for this course. You can achieve an A grade by regularly attending class and the labs, taking notes, consulting the lecture slides and lab manuals, and asking questions when the need for clarification arises. That said, some students appreciate having an additional resource available.

If you are going to purchase a textbook, I recommend: Field, A. P. (2017). *Discovering Statistics Using IBM SPSS Statistics (5th Edition)*. London: Sage. This is a playfully written statistics textbook and guide to using SPSS. The content includes analyses that are typically taught at the graduate level, and there are practice-exercises, data sets, and solutions to end-of-chapter questions posted on the book's website (https://edge.sagepub.com/field5e). This text is an especially useful resource for your honours thesis and graduate school. Some of the chapters are technical. You will probably have to read the same passage a few times in order to internalize the information. Don't be discouraged if you don't understand the content right away. Like any skill, statistics requires practice and patience.

Lab Manual and Videos: I have written a lab manual and created instructional videos for this course. The lab manual is comprised of step-by-steps instructions for conducting statistical analyses in SPSS. Each lab has a corresponding entry in the lab manual and instructional video, and all of the entries are posted on Moodle. You can rely on these entries when completing the data analysis assignments in lieu of the textbook.

Temporal Sequence of Lecture Topics

1. Research Methods
   a. Characteristics of Experimental and Correlational Designs
   b. Controlling for Confounds
   c. IV/DV, BS/WS
   d. Describing Factorial Designs
   e. Main Effects and Interactions
2. Statistical Inference
   a. Treatment vs. Chance
   b. Test Statistics
   c. P(D|H0) & Sampling Distributions
   d. Statistical Significance
   e. Non-Parametric tests
   f. Standard Error
   g. Confidence Intervals
3. Null Hypothesis Testing (NHT)
   a. Logic of NHT
   b. Alpha, Critical Region, p-values
   c. One vs. Two-Tailed Tests
   d. Factors that affect NHT
4. Power and Effect Size
   a. Type I & Type II Errors
   b. Power
   c. Factors affecting Power
   d. Measures of Effect Size
5. Single-Factor ANOVAs
   a. Experimentwise Alpha
   b. Between vs. Within Variability
   c. Multiple Comparison Procedures
   d. Repeated-Measures ANOVA

6. Factorial ANOVAs
   a. Main Effects and Interactions
   b. Partitioning Variance
   c. Simple Effects Testing
7. Research Proposal – Selecting a Topic
   a. Developing a Research Question
   b. Categories of Research Questions
   c. Search Strategies in psycINFO
8. Research Proposal – Experimental Design
   a. IV/DV, Task, Trial Sequence
   b. Stimuli, Procedure, Participants, Confounds, Hypotheses
   c. Reporting Standards for Methods
9. Research Proposal – Written Sections
   a. Five Components of an Introduction
   b. Headings in Literature Review
   c. Paragraph Structure
10. Research Proposal – Writing Tips
    a. Common Mistakes
    b. APA Style
    c. Examples of Poor Writing
    d. Discussion of Student's Sample Paragraphs
11. Correlational Designs
    a. Analyses in Correlational Designs
    b. Correlational Coefficients
    c. Factors affecting Correlation
12. Regression
    a. Model Building
    b. Regression Equation
    c. Residuals and Goodness of Fit
    d. Regression and NHT
    e. Assumptions
    f. Hierarchical Regression
    g. Moderation

Evaluation: Four take-home data analysis assignments, a research proposal, and participation / attendance. Each data analysis assignment is worth 10% of your final grade (for a total of 40%), the research proposal is worth 40%, and participation / attendance is worth 15%. Two sample paragraphs from the research proposal must be submitted on Tues. Nov 5th by Midnight, and are worth 5%.

Lab #	Topic	Lab Date (Thurs)	Evaluation Item	Due Date
1	Introduction to SPSS	Sept 5th	*Data Analysis Assignment #1: Data Cleaning, T-Tests, & Power*	Friday Oct 4th
2	Data Cleaning and Screening	Sept 12th		
3	T-Tests and Non-Parametric Equivalents	Sept 19st		
4	G*Power	Sept 26th		
5	ANOVA & Multiple Comparisons	Oct 10th	*Data Analysis Assignment #2: Single-Factor ANOVAs*	Friday Oct 25th
6	Repeated Measures ANOVA **(Monday Slot Schedule; Lab at 3:40)**	Oct 17th		
	Research Proposal		Two Sample Paragraph	Nov 5th
7	Factorial Fully BS ANOVA	Oct 31st	*Data Analysis Assignment #3: Factorial ANOVAs*	Friday Nov 15th
8	Factorial Fully WS & Mixed ANOVAs	Nov 7th		
9	Correlation	Nov 21st	*Data Analysis Assignment #4: Correlation & Regression*	Friday Dec 6th
10	Multiple Regression & Moderation	Nov 28th		
	Research Proposal		Final Draft	Dec 9th

Data Analysis Assignments: The data-analysis assignments are take-home exercises in SPSS that involve analyzing a data set. The format of the assignments will be similar to the practice exercises included at the end of each entry in the lab manual. I will email each assignment to students five days before the due date. Students are expected to type out their responses in Word and submit them as an attachment in an email. There are no labs during the weeks that a data analysis assignment is due; this

is intended to provide you with time to complete the assignments. G-20C will still be available during the regular lab period if you want to work on the assignment on Campus.

Research Proposal: The overall aim of the assignment is to mimic the initial stages of a comprehensive research project (e.g. an honour's thesis). The entire class will work on the same project, but each student will submit their own written research proposal. **The research topic will either be on Threat Perception of Face Perception**. The exact research question will be determined as a class after Thanksgiving. While working in conjunction with the professor and your peers, you will be tasked with searching for relevant peer-reviewed literature, evaluating and summarizing the relevant findings, identifying a gap in our understanding of the phenomenon/topic, developing a rationale for conducting a study to address that gap, proposing hypotheses that are relevant to the study, designing a **factorial experiment** to test the hypotheses, and anticipating data analysis strategies. While this might sound daunting, we will be working on your proposal together, progressing through each of the steps as a class as a whole.

There are four assigned readings for the research proposal, which are posted on Moodle. The readings are journal articles that provide a general overview of research on either Threat Perception or Face Perception. You are expected to complete one reading per week for the first four weeks of the course. These should give you sufficient background knowledge on the topics to start thinking about potential research questions.

> **A sample paper, assigned readings, and a detailed description of the research proposal, which includes a timeline, a sample outline, and writing instructions, are posted on Moodle.**

Extensions: If you are unable to submit an evaluation item, please notify me prior to the due date. In general, if you require an extension, I will grant one. Unless otherwise requested, I do not need supporting documentation. I understand that moments occasionally arise where it seems that factors beyond worldly comprehension have manifested and conspired to solely undermine your ability to perform and focus on your studies (e.g. loss of a beloved pet, illness, divorce or separation, family responsibilities). These moments, while distressing, should not ultimately impede your progress, as long as you have been taking your studies seriously up to that point. As such, an extension is reasonable accommodation to grant. That being said, if I obtain the impression that students are taking advantage of me or are simply trying to avoid responsibility, no extension will be granted, and you will receive a late penalty whose magnitude is determined by individual circumstances, including a grade of zero.

How to Succeed: My expectations are that you will attend class, pay attention, take notes, ask questions, contribute to the class exercises discussions, complete the readings, and give yourself plenty of time to complete the data analysis assignments and the steps of the research proposal. Essentially, my expectations are that you will take your responsibilities as a student seriously. I want you to succeed. I want you to obtain an 'A' grade. I want you to actually learn something and enjoy your time in this course. I have structured the course and the evaluation items so that students who make the effort to follow these expectations will be rewarded. Success in the course requires a fair degree of trust in one-another: you need to trust me that my approach to teaching the material is effective, and I need to trust that you are going to give an honest attempt at working through the material.

Statement on Academic Integrity (from the Instructor): All of the assignments for this course are take-home and open-book. The reason being is that I want you to spend time **THINKING** about statistics, and not simply memorizing the material so you can regurgitate it on in-class test. You will rarely ever be in a position where you only have 90 minutes to analyze a data set and answer questions about statistics without access to any resources. Consequently, I opted to give you the opportunity to work at your own pace, think about the questions carefully, and provide an answer that reflects your understanding rather than a verbatim output of a textbook.

Unfortunately, this method of evaluation opens the possibility of misuse of AI, plagiarism, misrepresentation, and other methods of academic dishonesty. As stated in the Senate Policy on Academic Integrity (https://www.brandonu.ca/senate-office/senate-policies/), students that are suspected of departing from academic integrity will have a hold placed on their course withdrawal eligibility, meet with the professor to determine student's responsibility for departure, and if the student was deemed responsible, face sanctions from the Dean, including: a grade of zero on the assignment, a grade of F-AD in the course, or expulsion from the university.

Accessibility Services: Brandon University values diversity and inclusion, recognizing disability as an aspect of diversity. Our shared goal is to create learning environments that are accessible, equitable, and inclusive for all students. The Student Accessibility Services (SAS) office works with students who have permanent, chronic, or temporary disabilities. SAS will provide and/or arrange reasonable accommodations. If you have, or think you may have, a disability (e.g. mental health, attentional, learning, vision, hearing, physical, medical, or temporary), you are invited to contact Student Accessibility Services to arrange confidential discussion at (204) 727-9759. If you are registered with SAS and have a letter requesting accommodations, you are encouraged to contact the instructor early in the term to discuss the accommodations outline in your letter. Additional information is available at the Student Accessibility Services website.

Psychology Department Statements Regarding Rewrites & Waiving Pre-Requisites:
The Psychology Department does not permit individual student rewrites of any exams (or any other alternate form of assessment).

The Psychology Department will not waive prerequisites unless the student can display sufficient background knowledge and/or experience. The student must provide the request to the department in writing for approval with appended documentation.

Letter Grade Equivalents:

A+ 90-100%	B+ 75-79%	C+ 61-64%	D 50-53%
A 85-89%	B 70-74%	C 57-60%	F Below 50%
A- 80-84%	B- 65-69%	C- 54-56%	