INSTRUCTOR:
Dr. Anastasia Newman
newmanan@mcmaster.ca

PROGRAM COORDINATOR:
Sarah Watson
irhbhsc@mcmaster.ca

SCHEDULE:
As per Mosaic

ATTENDANCE EXPECTATIONS AND RECORDINGS:
Attendance at synchronous/in-person lectures is strongly encouraged, but not monitored. Lectures will be recorded and made available for viewing the same day of lecture delivery via Echo 360.

OFFICE HOURS OR HOW/WHEN AVAILABLE:
As needed – please email the instructor to schedule a meeting.

TECHNOLOGY PLATFORM(S):
This course uses the Avenue to Learn platform, Echo360, and Microsoft Teams to share material and to communicate between students and faculty.

We will use Avenue to Learn (A2L) to post readings, slides, assignments, and videos (as applicable). All assignments will be submitted via A2L, and all feedback will be received through the platform. Students are encouraged to post any questions they have about course content on the A2L discussion board so that all students can see both the question and the response from the instructor.

There is an MS Teams group for this class. We will only use MS Teams to facilitate any lecture or tutorial that needs to transfer to asynchronous (virtual) for unforeseen circumstances (i.e., instructor illness, inclement weather, etc.). You will be provided with as much advanced warning as possible if this switch were to occur and this information would be shared on the A2L course platform and via McMaster email.

LEARNING OBJECTIVES:
By the end of this course, students should be able to:
1. Define and explain key statistical terms and concepts used in rehabilitation science
2. Differentiate between the different types of data and levels of measurement
3. Calculate and interpret measures of central tendency and measures of variability

4. Conduct and interpret common statistical tests (i.e., t-tests, chi-square tests)
5. Understand the basics of regression analysis, including simple linear regression and multiple regression
6. Apply statistical methods to analyze data sets from rehabilitation science research and draw conclusions from these results about clinical practice

MATERIALS AND TEXTBOOK:
Pagano, M., Gauvreau, K., & Mattie, H. (2022). Principles of Biostatistics (3rd ed.). Chapman and Hall/CRC. https://doi.org/10.1201/9780429340512.

Copies of the textbook are available for purchase at the Campus Bookstore. However, in an effort to save costs, the Health Sciences Library (HSL) has recently purchased three (3) online copies of the third edition. There is also a physical copy of the second edition textbook at the HSL as well as three (3) online copies of the older edition. Class readings have been provided for both editions to allow for more students to access the library copies each week.

IRH 2ST3 will use **R Programming** and **R Studio** to conduct statistical analyses. These are free, open-source programs that can be downloaded from R: The R Project for Statistical Computing and Download RStudio - Posit.

COURSE OVERVIEW AND ASSESSMENT:
This course will introduce students to the fundamental statistical concepts and techniques relevant to research and data analysis in rehabilitation science. Students will be familiarized with the basic statistical principles, including descriptive statistics, probability, distributions, hypothesis testing, and measures of central tendency. This course will also cover graphical representation of data, parametric and nonparametric tests, and the use of common statistical software to manage and perform various statistical tests. Students will be instructed on how to critically appraise rehabilitation literature and how to effectively report statistical findings in publications. Emphasis will be placed on the practical application of statistics to clinical scenarios and relevant research from the field of rehabilitation science.

Evaluation

Component	Proportion of Final Grade	Due Date
Class Review Presentation	10%	As assigned by instructor
Summary Review Document	10%	Day of class review presentation
In-Class Participation	10%	Throughout term
Midterm Exam	30%	February 12, 2015
Final Exam	40%	TBD

* Students will NOT be permitted to do additional assignments or extra work at the end of the term to improve their grades.

Class Review Presentation (10%)
In groups of three to four (3-4), students will be assigned a class topic to summarize and review for their peers. These presentations will cover the statistical contents of the assigned week as well as an overview of the homework associated with that class' material. Students will prepare a 15-20-minute presentation and must consider how to engage their peers with the material. Students will perform

peer- and self-evaluations for their group and these will help inform the grading decision.

Summary Review Document (10%)
Students will be responsible for creating a 1-2 page "cheat sheet" about their week's material as part of their class review presentation. This document should include summaries of class learning objectives, key content and concepts, programming instructions for R, and at least two (2) additional learning resources used to supplement their learning that week (i.e., websites, other textbooks (must be available online for accessibility), journal articles).

Participation (10%)
Participation grades will be evaluated on a weekly basis and will be determined by attendance throughout the term, engagement in class discussions (both in-person and online), and interactions with peers and facilitator throughout the course.

Midterm Examination (30%)
The midterm examination is scheduled for Wednesday February 12, 2025, and will be administered in-person during scheduled class time. The examination will consist of 30-40 multiple choice and short answer questions, and you will have the entire 2-hour class time to complete it. The midterm will cover material from the first class until February 5, 2025.

Final Examination (40%)
The final examination is cumulative and will cover material from the start of the semester. The examination will consist of 50-60 multiple choice and short answer questions and will be scheduled via the Registrar's Office during the University's examination period. You will have two (2) hours to complete the examination.

Important Dates

Event	Dates
First day of class	Wednesday January 8, 2025
Midterm Examination	February 12, 2025 (in-class)
Reading Week	February 17-21, 2025
Course review presentation	As assigned by the instructor
Last day of classes	Tuesday April 8, 2025
Final examination	Scheduled by Registrar

Course Schedule

Class Date	Class Topic	Class Readings
January 8, 2025	Course overview • Discuss weekly schedule • Review class expectations • Weekly homework assignments • Introduction to R programming	None
January 15, 2025	Describing data • What is measurement? • Types of numerical data	Pagano 2018: • Chapters 2 and 3

	• Descriptive statistics • Graphical representation of data	Pagano 2022: • Chapter 2
January 22, 2025	Probability • Binomial distributions • Poisson distributions • Normal distributions	Pagano 2018: • Chapters 6 and 7 Pagano 2022: • Chapters 5, 6, and 7
January 29, 2025	Samples and populations • Parameter estimation • Hypothesis testing • P-values • Null and alternate hypotheses • Type I and Type II errors	Pagano 2018: • Chapters 8, 9, and 10 Pagano 2022: • Chapters 8, 9, and 10
February 5, 2025	Comparing two groups • t-distribution and assumptions • t-tests (paired and independent) • Wilcoxon signed rank test • Wilcoxon rank sum test • Sample size calculations	Pagano 2018: • Chapters 11 and 13 Pagano 2022: • Chapters 11 and 13
February 12, 2025	Midterm examination (in-class)	NA
February 17-21, 2025	**READING WEEK**	**READING WEEK**
February 26, 2025	Comparing more than two groups • Oneway ANOVA and assumptions • Multiple comparisons • Kruskal-Wallis test • Sample size calculations	Pagano 2018: • Chapter 12 Pagano 2022: • Chapters 12 and 13 (pgs. 307-310)
March 5, 2025	Repeated measures ANOVA • Comparing two groups at multiple time points • Intraclass correlation coefficient • Standard error of measurement	Biostatistics: The Bare Essentials by Norman and Streiner (third or fourth editions): • Chapter 11 Available online at HSL
March 12, 2025	Simple Regression and Correlation Analyses • Assumptions of linear regression • Pearson's correlation • Spearman rank order correlation	Pagano 2018: • Chapters 17 and 18 (pgs. 415-428) Pagano 2022: • Chapters 16 and 17
March 19, 2025	Regression diagnostics and multivariable regression	Pagano 2018: • Chapter 19 Pagano 2022: • Chapter 18
March 26, 2025	Categorical analysis	Pagano 2018:

	• Contingency table analysis • Chi-square distribution • Fisher's exact test • McNemar's test	• Chapters 14 and 15 (pgs. 342-352) Pagano 2022: • Chapters 14 and 15
April 2, 2025	Logistic regression analysis • Application of multiple continuous variables • Application of continuous and categorical variables	Pagano 2018: • Chapters 16 and 20 Pagano 2022: • Chapter 19

REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK (MSAF):
In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

For absences from classes lasting up to 3 sessions: Using the McMaster student absence form (MSAF) on-line, self-reporting tool, undergraduate students may report absences lasting up to 3 days and may also request relief for missed academic work. The submission of medical or other types of supporting documentation is normally not required. Students may use this tool to submit a maximum of one request for relief of missed academic work per term. Students must immediately follow up with the course instructor regarding the nature of the relief. Failure to do so may negate the opportunity for relief. It is the prerogative of the instructor of the course to determine the appropriate relief for missed term work in this course.

For absences from classes lasting more than 3 days: Students who are absent more than five days cannot use the self-reporting tool to request relief. They MUST report to their Faculty Office to discuss their situation and may be required to provide appropriate supporting documentation. If warranted, students will be approved to use a discretionary version of the MSAF on-line, self-reporting tool.

For the reporting of more than two requests for relief per term: Students who wish to submit more than two requests for the relief of missed academic work per term cannot use the online, self-reporting tool to request relief. They MUST report to their Faculty Office to discuss their situation and may be required to provide supporting documentation. If warranted, students will be approved to use a discretionary version of the MSAF on-line, self-reporting tool.

For absences from classes lasting more than five days or for the reporting of more than requests for relief per term: If the reason was medical, the approved McMaster University Medical Form covering the relevant dates must be submitted. The student must be seen by a doctor at the earliest possible date, normally on or before the date of the missed work and the doctor must verify the duration of the illness. Relief will not be considered for minor illnesses. If the reason is non-medical, appropriate documentation with verifiable origin covering the relevant dates must be submitted, normally within five working days. In some circumstances, students may be advised to submit a Petition for Special Consideration (Form A) seeking relief for missed academic work. In deciding whether or not to grant a petition, adequacy of the supporting documentation, including the timing in relation to the due date of the missed work and the degree of the student's

incapacitation, may be taken into account. If the petition is approved the Faculty Office will notify the instructor(s) recommending relief. The student must contact the instructor promptly to discuss the appropriate relief. Failure to do so may negate the opportunity for relief. It is the prerogative of the instructor of the course to determine the appropriate relief for missed term work in his/her course.

The MSAF on-line, self-reporting tool cannot be used to apply for any final examination or its equivalent. See Petitions for Special Consideration in this section of the Calendar. Students should expect to have academic commitments Monday through Saturday but not on Sunday or statutory holidays. Students who require accommodations to meet a religious obligation or to celebrate an important religious holiday should make their requests within three weeks of the start of term to their Faculty office. With a valid MSAF report, missed course work's percent worth will be added to the percent worth of the Final Integrated Report. Without a valid MSAF report, a missed course work will be given a mark of zero. There will be no discretionary approvals given by the Professor.

As a student enrolled in this course you have been granted permission to access an online learning management system Avenue to Learn. Avenue to Learn course pages are considered an extension of the classroom and usage is provided as a privilege subject to the same code of conduct expected in a lecture hall (see relevant section of the student code of conduct below). This privilege allows participation in course discussion forums and access to supplementary resource course materials. Please be advised that all areas of Avenue to Learn, including discussion forums, are owned and operated by McMaster University. Any content or communication deemed inappropriate by the course instructor (or designated individuals) may be removed at her/his discretion. Per the University Technology Services Code of Conduct, all members of the McMaster community are obligated to use computing resources in ways that are responsible, ethical and professional. Avenue to Learn Terms of Use are available at http://avenue.mcmaster.ca.

CONDUCT EXPECTATIONS:
As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the Code of Student Rights & Responsibilities (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, whether in person or online.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

ACADEMIC INTEGRITY:
You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. The academic credentials that you earn are rooted in the principles of honesty and academic integrity.

It is your responsibility to understand what constitutes academic dishonesty.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned

academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy. Important and helpful information can be found here.

The following illustrates only three forms of academic dishonesty:
- plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

AUTHENTICITY/PLAGIARISM DETECTION:
Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty. Students who do not wish to submit their work through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES:
Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's Academic Accommodation of Students with Disabilities policy.

ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO):
Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students requiring a RISO accommodation should submit their request to their Faculty/Program Office *normally within 10 working days* of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructor/coordinator as soon as possible to make alternative arrangements for classes, assignments, and tests.

COURSES WITH AN ONLINE ELEMENT:
Some courses may use online elements and platforms. Students should be aware that, when they make use of these platforms, information such as first and last names, usernames for the McMaster email accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

COPYRIGHT AND RECORDING:
Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors. Students must not disseminate these materials to others not registered in the course, or post to third-party websites. The recording of lectures, tutorials, or other methods of instruction may occur during a course by the instructor for instructional purposes; students may make recordings for the purpose of personal study but must not be disseminated in any form. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

ONLINE PROCTORING:
Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

EXTREME CIRCUMSTANCES:
The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (severe weather, labour disruptions, etc). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L, Microsoft Teams and/or McMaster email.

HEALTH AND WELLNESS RESOURCES FOR STUDENTS:
As a signatory on the Okanagan Charter, McMaster University is committed to enhancing mental health and wellness and provides various resources for students to manage their well-being. Students are encouraged to seek support as necessary; the following are several campus- and community-based resources that you may find helpful. For more resources and additional information, please visit https://wellness.mcmaster.ca/resources/

> **ON-CAMPUS RESOURCES:**
>
> **Student Wellness Centre:** Provides counselling, medical services, wellness education, guided self-help, and other relevant resources. PGCLL 210; 905-525-9140, x27700; https://wellness.mcmaster.ca
>
> **Sexual Violence Support:** An on-campus resource where students, staff, and faculty of all backgrounds and social identities can find support and information about sexual, intimate partnership or family violence. UH 104; 905-525-9140 x20909; https://svpro.mcmaster.ca
>
> **Faculty/Program Office:** Feel free to contact an Academic Advisor in your Faculty/Program Office who can connect with academic advising and connect you with other resources.
>
> **OFF-CAMPUS RESOURCES:**

Good2Talk: Free, confidential helpline providing professional counselling and information and referrals for mental health, addictions and well-being to post-secondary students in Ontario, 24/7/365; 1-866-925-5454; https://good2talk.ca

SACHA (Sexual Assault Centre - Hamilton Area): Confidential, anonymous 24-hour nonjudgmental telephone support for adults who have experienced sexual violence. 905-525-4162; http://sacha.ca

If you have immediate safety concerns for yourself or others, call **Campus Security** who will respond with the **MSU Emergency First Response Team (EFRT)** at 905-522-4135 or call 911 if you are off campus.

COURSE MODIFICATION:
At certain points in the course, it may make good sense to modify the schedule, deadlines, evaluation, or other elements. If such changes become necessary, students will be notified accordingly.

GRADING SCALE:
Conversion from percentages to letter grades will follow the standard McMaster procedure. **All percentage grades within 0.5% of the next letter grade will be reviewed (rounding not guaranteed).**

%	Letter	%	Letter	%	Letter	%	Letter	%	Letter
90-100	A+	77-79	B+	67-69	C+	57-59	D+		
85-89	A	73-76	B	63-66	C	53-56	D	0-49	F
80-84	A-	70-72	B-	60-62	C-	50-52	D-		

EMAIL COMMUNICATION:
All emails sent to the instructor must originate from your **official McMaster University email accounts**.

REFERENCING STYLE:
Within the course, APA 7th edition formatting is the preferred referencing style.

LAND ACKNOWLEDGEMENT:
McMaster University recognizes and acknowledges that it is located on the traditional territories of the Mississauga and Haudenosaunee nations, and within the lands protected by the Dish with One Spoon wampum agreement.