



HPHY 205 – Fall 2022

Experimental Design & Statistics

Department of Human Physiology

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**Lecture Section 03:** TR 10:50-12:05, 840HSB 210

**Janet Zhang-Lea**

**Office:** 830HSB 327

**Zoom Office:** <https://gonzaga.zoom.us/j/9706245962>

**Office Hours:** Tues 2-4 pm in-person; Wednesday 10-12 am on Zoom.  
Or by appointment

**Email:** [lea@gonzaga.edu](mailto:lea@gonzaga.edu)

**Phone:** (509) 313-4798

**OVERVIEW:**

This course introduces students to the basic concepts of statistics and statistical applications used by scientists in the discipline of human physiology. Relationships among research, experimental design, measurement, and statistics will be addressed.

**GOALS:**

Students will develop a conceptual understanding of statistics and the ability to effectively navigate SPSS to analyze data using descriptive and inferential statistics. In addition, students will learn how to interpret statistics in peer-reviewed research and how to apply statistical methods to data and research questions in human physiology.

**SPECIFIC STUDENT OUTCOMES ARE:**

Students will demonstrate content knowledge in selected areas:

- 1) Scientific methodology
- 2) Data Analysis
- 3) Statistical Assumptions
- 4) SPSS Usage
- 5) Statistical Methods
- 6) Graphing of Data

**COURSE LEARNING OBJECTIVES:**

- A. Understand and apply the scientific method using topics within human physiology.
- B. Create working knowledge of statistics through understanding the theory behind the calculations and the applying of SPSS analysis steps. The specific SPSS skills students will achieve are data entry, steps for statistical analysis, and plotting data.

- C. Define models and evaluate hypotheses using the correct statistics, specifically, descriptive statistics (measures of central tendency and variability or dispersion), standardized scores such as z scores and percentiles, and inferential statistics (including t-tests, ANOVA's, and bivariate and multiple correlation and regression).
- D. Accurately report and explain statistical results.
- E. Create critical thinking skills by developing research questions after critically reading and reviewing peer-reviewed research in human physiology and related disciplines.

**LEARNING ACTIVITIES:**

- A. Assigned readings and lectures
- B. Assignments
- C. Class Lab Assignments
- D. Class discussions

**EXAMINATIONS:**In Class Examinations:

In class examinations will be given twice during the semester. Each exam will cover material from the lectures, assignments, and in class labs. The dates will be announced in class.

Assignments:

Students will periodically be assigned out of class assignments to reinforce class topics. Assignments are due at the assigned time and date. Assignments turned in late will lose 50% if turned in one day late. No credit after the second day.

In Class Labs:

In class computer labs will be conducted to familiarize students with data analysis using SPSS. Assignments for the labs will be turned in for grading on the assigned date.

Final Exam:

Section 03: Wednesday Dec 14th 3:30-5:30

The final exam will be a comprehensive exam covering all material introduced during the semester.

Make-up examinations will only be granted for ***serious*** and ***documented*** extenuating circumstances and only if the instructor is notified **beforehand**.

**GRADING:**

Homework assignment (6 @ 5% each)	30 %
Examinations (2 @ 20% each)	40 %
Final Exam	30 %
<b>Total</b>	<b>100 %</b>

≥ 92%	A	73-76%	C
90-91%	A-	70-72%	C-
87-89%	B+	67-69%	D+
83-86%	B	60-66%	D
80-82%	B-	< 60%	F
77-79%	C+		

**Note:** All assignments are due at the beginning of class. Assignments turned in late will lose 50% if turned in one day late. No credit will be awarded after the second day.

**RECOMMENDED TEXT:**

Field, A. (2013). Discovering Statistics Using SPSS. (4th edition). London: Sage Publications, Inc.

Lecture materials and the course syllabus are available on Blackboard (<http://learn.gonzaga.edu/>). Blackboard will also be used for posting class announcements.

**Topics** (Subject to change)

- 1) Introduction to Statistical concepts
- 2) Scientific Method
- 3) Analyzing Data
- 4) Using SPSS
- 5) Parametric Data
- 6) Correlation
- 7) Regression
- 8) Comparing Means
- 9) ANOVA

<b>Week</b>	<b>Topic(s)</b>	<b>Assignment</b>
1	Intro - Research, measurement, & statistics <ul style="list-style-type: none"> <li>• Stats in society, incorrect usage</li> <li>• Definitions</li> <li>• Quantitative vs. Qualitative</li> </ul>	Chap. 1
2	The scientific method/Process/Statistics Theory <ul style="list-style-type: none"> <li>• Types of data</li> <li>• Data collection</li> </ul>	Chap. 1,2

- Measurement error
  - Theories, Ho vs H1
  - Types of variables, levels of measurement
  - Confounding variables
  - Independent vs Repeated Measures
  - Randomization & Counterbalancing
  - Types of variation
  - Histograms, skew kurtosis, normality
  - Intro to Central tendency
  - Range, Quartiles
  - Z-scores
  - Research process
  - Population vs. Sample
- 3      **Statistical models**      Ch. 1, 2
- Frequency Distributions
  - Concept of Statistical Model (incl. Mean)
  - Assessing model Fit
  - Error in statistics
  - Derivation of Deviation, SSE, var, SD (with Ex. And calcs)
  - Degrees of Freedom
  - Confidence Intervals
  - Test Statistics
  - One vs. Two-tails
  - Types of error
  - Effect Size
  - Statistical Power
- 4      **Statistical models (cont.)**      Ch. 2
- 5      **Statistical models (Cont.)**      Ch 2.  
 \*\*\*Exam 1\*\*\* (30 Sep - *tentative*)
- 6      **Introduction to SPSS**      Ch. 3
- Orientation to SPSS
  - Differences between Excel
  - Data vs. Variable tabs
  - Enter example data set – adjust variable settings
  - Overview of Menus
  - Chart Builder
  - Generating Statistics - Descriptive Data
  - Histograms, Boxplots, Error bars, scatter plots, Bar graphs
- Exploring Data      Ch. 4
- Histograms
  - Boxplots
  - Bar Charts

- Line charts
  - Scatterplots
  - Matrix plots
- 7 Assumptions of parametric data, outliers, transformations Ch. 5
- 4 Assumptions
  - Outliers & Bias and effects
  - Normal Distribution
  - Graphical analysis
  - Skew and Kurtosis, and analytics
  - Sample size and normality
  - Levene's test, Variance Ratio
  - K-S Test
  - PP Plot
  - Transforming Data
- 8 Assumptions (cont.) Chap. 5
- Correlation: bivariate, multiple, partial Chap. 7
- Definitions of correlation, positive, negative, no
  - Value of correlation
  - Derivation of formulae: covariance, correlation coefficient, coeff. of det.
  - Example calculations
  - Effect sizes
  - Evaluating correlations
  - Performing in SPSS
  - Third variable problem
  - Partial and Semi-partial correlations
  - Non-parametric correlations
  - Reporting
- 9 Correlation (cont.) Chap. 7
- 10 Correlation (cont.) Chap. 7
- \*\*\*Exam 2\*\*\* (4 Nov *tentative*)
- 11 Regression: bivariate (Simple linear) Chap.8
- Definition, mathematical line
  - Least squares fitting
  - Using as model, residuals
  - SST, SSR, SSM
  - Testing – ANOVA
  - R2 value, MSE's
  - Graphing, SPSS analysis
  - Reporting
- 12 Regression: multiple Chap.8
- Differences in simple linear vs. multiple
  - Methods of entering variables

- Assessing model fit parameters
  - Assessing beta contributions
  - Using semi-partial correlations
  - Using and interpreting change statistics
  - Standardized betas
  - Checking assumptions
  - Standardized residuals
  - Cooks distance
  - Durbin-Watson
  - Multi-collinearity
  - Tolerance/VIF
  - Reporting
- 13      Comparing means: t-tests      Chap. 9
- Basis of t-tests
  - Types of experiments/when used – design for
  - Dependent vs. Independent
  - Formula, derivation and calculations
  - Assumptions
  - SPSS and output
  - Pooled variance
  - Non-parametric
  - Reporting
- 14      Analysis of variance (ANOVA)      Chap. 11
- Independent one-way ANOVA
  - Assumptions
  - Vs. T-tests, and FWER
  - Hypotheses
  - Derivation
  - Compared to regression
  - SS's and F ratio
  - Interpreting outcome
  - Post-hoc analyses
  - SPSS
  - Reporting
- 15      ANOVA (continued)      Chap. 11
- 16      Final Exam
- Note: Exam dates are tentative and will depend upon the pace and material covered in lecture.*

### **Use of Laptops, Mobile Devices, mp3 Players, etc...**

Use of these devices is limited to activities related to class. Any student using these devices otherwise (i.e. Facebook, Twitter, texting, phone calls, etc...) during class will be asked to leave

immediately. The only exception will be for emergencies. Use of laptop computers is permitted during lecture for note taking purposes only. Should a student need to use a calculator during exams, an actual calculator must be used – not a cell phone, smart phone, tablet, PDA, or any other programmable device of the sort.

### **Blackboard, e-mail and Web policy:**

It is your responsibility to check class announcements on the Blackboard and your Gonzaga e-mail address. On occasion, there might be important messages announced on the Blackboard and/or sent to you via the e-mail so that all students will be kept up-to-date on all pertinent information. It is my assumption that you are aware of and therefore in compliance with this information.

Please correspond with your professor using your Gonzaga e-mail address. Messages from other accounts will not receive a response. Please do not e-mail your professor with questions about course content (i.e. questions to be answered to clarify concepts, etc), or for questions regarding information found in the syllabus. E-mail should be used to schedule meetings with your professor, notify your professor of absence, etc. The goal is to encourage students to discuss content related questions with your professor in person, rather than by e-mail. Content questions can also be posted on the course's Blackboard discussion board. The class is encouraged to post questions and answers to content related topics. Your professor will monitor the discussions and add/clarify information when needed.

## **Syllabus Statements**

### **Class Attendance Policy**

Gonzaga University presumes that students have sufficient maturity to recognize their responsibility for regular class engagement, and we maintain a general expectation that students will attend courses.

Gonzaga's standard policy on absences applies in this course, that the maximum allowable absence is two class hours (100 minutes) for each class credit. For three-credit classes, the maximum absence is, therefore, six class hours (300 minutes). The grade given for excessive absences is a "V," which has the same effect as "F" (Fail) and is counted in the GPA. This outcome can be appealed to the Dean of the College/School in which the course is offered. Academic support will be provided for students who are impacted by COVID-19 related sickness and periods of quarantine or isolation on a case-by-case basis. Please notify me in-person, via a phone call (5093134798) or email me ([lea@gonzaga.edu](mailto:lea@gonzaga.edu)) if you will miss a class and need academic assistance. **If you will miss an exam, please notify me at least 2 weeks before the date of the exam for me to arrange accommodations.**

### **Class Recordings**

In class sessions will not be recorded. This may change depending on the number of Covid-19 related absences and classroom technology to allow recording. This course may make use of pre-recorded material that will be available to you for each topic in the course. **You may not duplicate or distribute these prerecorded materials.** Your compliance with the terms of this syllabus regarding use of class recordings is subject to the [Student Code of Conduct](#); violations will be reviewed according to the provisions in the [Administration of Student Code of Conduct](#).

### **Academic Integrity Policy**

All members of the Gonzaga community are expected to adhere to principles of honesty and integrity in their academic endeavors, and this course will abide strictly by procedures and guidelines of the University's Academic Integrity Policy, which can be found in full [here](#) or at the [Academic Integrity Policy Resources webpage](#). Students and faculty are governed by this policy. Familiarize yourself with its scope and procedures. Ignorance of the policy shall not serve as a defense against any violations.

### **Students with Disabilities/Medical Conditions and Accessible Documents (EITA)**

The Americans with Disabilities Act is a federal anti-discrimination statute that provides civil rights protection for persons with disabilities and requires that students with disabilities be guaranteed a learning environment that provides reasonable accommodations. As COVID-related challenges persist, students with qualifying disabilities and/or medical conditions, as per [CDC recommendations for higher education](#), are eligible for and may request reasonable accommodations through established procedures. Students should contact the [Disability Access Office](#) to begin the process. In addition, Gonzaga University seeks to provide equal access to electronic content consistent with applicable federal and state laws, such that when possible "Accessible Documents" will be created with the proper formatting tools to maximize communication of content regardless of what device or adaptive equipment he or she is using; see [Electronic Information Technology Accessibility \(EITA\)](#).

### **Statement Regarding Course Expectations**

As a Jesuit university that seeks to provide an equal opportunity to learn for all students, this course is offered with the expectation that students are here voluntarily, and understand that the university expects all interactions relating to its courses to occur in the context of a professional academic work environment that is welcoming and accessible to all students regardless of gender, race, ethnicity, religion, disability, sexual orientation or identity and any other non-merit factor in educational programs or activities. This environment includes virtual course environments, such as Blackboard, and any course-related communications via e-mail and social media. We strive to create a healthy environment conducive to intellectual honesty and free inquiry; as such, behaviors which constitute harassment, discrimination, or hostile and/or inappropriate conduct will not be tolerated, and faculty, staff and administrators will take action to ensure such matters are addressed promptly and appropriately.

### **Notice of Non-Discrimination**

Gonzaga University does not discriminate against any person on the basis of race, color,



religion, national origin, sex, marital status, sexual orientation, gender identity, age, disability, military status, or any characteristic protected by local, state, or federal law, or any other non-merit factor in employment, educational program, or activities that it operates.

### **Harassment & Discrimination Policy**

Consistent with its mission, Gonzaga seeks to assure that all community members learn and work in a welcoming and inclusive environment (please review [Harassment & Discrimination Policy](#)). Title VII, Title IX and Gonzaga's policy prohibit gender-based harassment, discrimination and sexual misconduct, including sexual assault, dating and domestic violence, and stalking. Gonzaga encourages anyone experiencing gender-based harassment, discrimination or sexual misconduct to talk to someone from Gonzaga's reporting and support resources list found here: [Title IX | myGU \(my.gonzaga.edu\)](#).

### **Resources and Reporting Options for Incidents of Sexual Misconduct**

It may be helpful for students to talk about what happened in order to get the support needed and for Gonzaga to respond appropriately. There are options for support and resolution, namely confidential support resources and campus reporting and support options are available [here](#). Gonzaga will respond to all reports of sexual misconduct in order to stop the harassment, discrimination, or misconduct; prevent its reoccurrence; and address its effects. Responses may vary from support service referrals to formal investigations.

Faculty members can connect students to resources on campus, including those who are specially trained in and experienced in assisting in such complaints, and therefore will report all incidents of gender-based harassment, discrimination and sexual misconduct to Title IX to provide the Title IX Director with all relevant details, including names and identifying information, of the incident reported. A representative from that office will reach out to the student via phone and/or email to explore options for support, safety measures and reporting. For more information about policies and resources or reporting options, please visit the [Equity, Diversity & Inclusion at Gonzaga Webpage](#) and [Title IX](#). To make a report of harassment, discrimination or sexual misconduct directly:

- Contact the Title IX Coordinator by phone, email, or in person:

Stephanie Thomas, Title IX Coordinator, 509-313-6910, [thomassn@gonzaga.edu](mailto:thomassn@gonzaga.edu), Business Services Building, Office 18

- Or complete an [online reporting form](#).

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The Americans with Disabilities Act is a federal anti-discrimination statute that provides civil rights protection for persons with disabilities and requires that students with disabilities be guaranteed a learning environment that provides reasonable accommodations. As COVID-related challenges persist, students with qualifying disabilities and/or medical conditions, as per [CDC recommendations for higher education](#), are eligible for and may request reasonable accommodations through established procedures. Students should contact the [Disability Access Office](#) to begin the process. In addition, Gonzaga University seeks to provide equal access to electronic content consistent with applicable federal and state laws, such that when possible

“Accessible Documents” will be created with the proper formatting tools to maximize communication of content regardless of what device or adaptive equipment he or she is using; see [Electronic Information Technology Accessibility \(EITA\)](#).

### **FERPA and Privacy**

Under [FERPA](#) (Family Educational Rights and Privacy Act), your educational records are confidential and protected. Under most circumstances your records will not be released without your written and signed consent, which must be documented through the Registrar’s Office. Instructors are not allowed to publicly post grades by student name, social security number, GU student identification number, or any other identifiable means, without written consent from the student. The FERPA policy does not apply to third party online applications that may be used in courses such that it is the student’s responsibility to read the privacy documentation at each site.

### **Course Evaluations**

At Gonzaga, we take teaching seriously. We ask our students to evaluate their courses and instructors so that we can improve our classes and programs and provide the best possible learning experience. Near the end of the semester, students will be asked to complete the course/instructor evaluation on-line to provide feedback on their classroom experience (see the [Course Evaluations website](#) for more information). This feedback is important and appreciated.

### **Diversity, Equity and Inclusion**

Our human differences contribute to the richness of our academic community life. In partnership with the [Office of Diversity, Equity & Inclusion](#), we expect everyone to cultivate an academic environment that is welcoming and accessible to students, staff, and instructors regardless of gender, race, ethnicity, religion, disability, and sexual orientation or identity. The [Bias Incident Assessment and Support \(BIAS\) Team](#) exists to foster a campus environment where everyone feels safe and respected. Those who experience or witness a bias incident should visit the [BIAS Report site](#).

### **Religious Accommodations for Students**

In compliance with Washington State law, Gonzaga University will reasonably accommodate students who, due to the observance of religious holidays, expect to be absent or endure a significant hardship during certain days of their academic course or program. Gonzaga University prohibits discrimination, harassment, and retaliation on the basis of religion. The Religious Accommodations for Students policy as well as the process by which students can request accommodations can be found on the [Academic Policies and Procedures Webpage](#).

**Table of associated links** for university and academic policy statements that are relevant to classroom learning and syllabi.

University and Academic Policy Statements	Associated Links
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<b>Diversity, Equity and Inclusion</b>	<a href="#">Visit Equity, Diversity &amp; Inclusion at Gonzaga Page</a> <a href="#">Bias Incident Assessment and Support (BIAS) Team</a>
<b>Harassment and Discrimination Policy</b>	<a href="#">Harassment &amp; Discrimination Policy</a> <a href="#">Title IX I myGU (my.gonzaga.edu)</a>
<b>Academic Integrity Policy</b>	<a href="#">Visit Academic Integrity Policy Resources Page</a>
<b>Students With Disabilities/Medical Conditions and Accessible Documents (EITA)</b>	<a href="#">Disability Access Office</a> <a href="#">EITA Office</a>
<b>Religious Accommodations for Students</b>	<a href="#">Visit Academic Policies and Procedures Page</a>
<b>FERPA and Privacy</b>	<a href="#">FERPA</a>
<b>Class Attendance Policy</b>	<a href="#">Visit Academic Policies and Procedures Page</a>
<b>* Class Recording Policy (audio, video, and photos)</b>	<a href="#">Visit Academic Policies and Procedures Page</a> <a href="#">GU Student Code of Conduct</a>
<b>Course Evaluations</b>	<a href="#">Accessing and Timing of Course Evaluations</a>