# EAB 6750: Quantitative Methods

| General | Instructor |
|---|---|
| T \| Periods 4-5<br>(10:40 AM - 12:35 PM)<br>BEN 0328<br><br>R \| Period 4<br>(10:40 AM - 11:30 AM)<br>BLK 0315) | Dr. Jesse Dallery<br>Room 92, Psychology<br>Office Hours: by appt.<br>Email: dallery@ufl.edu<br>Phone: 273-2182 |

## Overview

One goal of a science of behavior is to discover invariance, or regularity in nature. As defined by the mathematician E. T. Bell, "invariance is changelessness in the midst of change, permanence in a world of flux, the persistence of configurations that remain the same despite the swirl and stress of countless transformations."

This course will introduce statistical and quantitative techniques in single-case research. These techniques attempt to detect and describe - amidst the flux - regularities in nature, whether treatment effects or physical processes. Among other questions, we will ask: What are the strengths and limitations of our approaches? How can we improve our detection techniques? What are contemporary mathematical models of operant behavior? How do we evaluate these models? Why are they important? Skinner provided the beginning of an answer to the last question:

> Beyond the collection of uniform relationships lies the need for a formal representation of the data reduced to a minimal number of terms. A theoretical construction may yield greater generality than any assemblage of facts... It will not stand in the way of our search for functional relations because it will arise only after relevant variables have been found and studied. Though it may be difficult to understand, it will not be easily misunderstood…" (Skinner, 1950/1972, p. 100).

Skinner's assessment of theory, however, was tempered by an emphatic recommendation that we must first establish an experimental analysis of how relevant variables affect behavior (Skinner, 1950/1972). In the case of a quantitative theory, for instance, the progression from experimental analysis to theory should increase the likelihood that the theory's parameters reflect the operation of definite variables and processes, rather than simply being "arbitrary constants." Of course, a progression from theory to further experimental analysis may also reveal novel functional relations and behavioral processes. Regardless of the sequence, quantitative theory may increase the generality and precision of our understanding of environment-behavior relations. Just as the universal law of gravitation yields considerable predictive and practical advantages over the statement that objects fall when dropped, a quantitative theory of

behavior can move us beyond the statement that operant responding increases when reinforced (or any similar "assemblage of facts"). In short, a quantitative theory should improve our ability to predict and influence behavior, which is a hallmark of behavior-analytic science.

As we progress through quantitative methods, which will be applicable to a wide variety of biological and behavioral systems, we will also explore several models of operant behavior. These models will provide some theoretical content, some backbone, as we tackle some techniques to analyze them.

If you do not have a background in basic EAB, this course will be challenging. Please note that if you are not a student in the Behavior Analysis Program, we will need to discuss your enrollment in the course.

I have also selected readings to broaden your scholarly repertoires with respect to statistics, statistical thinking, and especially null hypothesis significance testing. The focus will be on thinking about statistics as opposed to calculating statistics.

The course will involve lecture, small group activities, discussion, and several hands-on assignments. We will make extensive use of Microsoft Excel for graphing, and statistical and quantitative analysis.

## Readings

The required text is Intuitive Biostatistics, Fourth Edition by Harvey Motulsky. It is available at the bookstore and online. I am also recommending: Fitting models to biological data using linear and nonlinear regression (by Motulsky and Christopoulis). A pdf of the Fitting models book will be available in Canvas. You should also consider purchasing the book, particularly if you will be doing curve fitting and other quantitative techniques. Other readings will be available in Canvas.

I expect you to read the chapters and articles carefully. Write down any questions you have about the readings. Some of the material will be difficult, so take your time, re-read, and use me as a resource (e.g., email me if you have questions as you are reading).

## Software

We will use Microsoft Excel and GraphPad Prism. Please have both installed within the first week of class.

## Grading

Assessments: There will be two assessments, each worth 100 pts.

Class engagement: Class participation will be worth 100 points. You will self-evaluate your engagement at two timepoints during the class. A rubric is available in Canvas.

| Category | Points | Grade | Percentage |
|---|---|---|---|
| Exams | 200 | A | 93-100 |
| | | A- | 90-93 |
| Engagement | 100 | B+ | 87-90 |
| | | B | 83-87 |
| Total Points | 300 | B- | 80-83 |
| | | C+ | 77-80 |

Note: This syllabus is subject to change. Changes will be announced in class and an updated syllabus will be available on the website.