One-Way ANOVA in R

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Focus: One-way analysis of variance (ANOVA), following the text in Chapter 5 of Beckerman et al. (2017) *Getting started with R: an introduction for biologists, 2nd edition.*

Overview: In this lesson, students will learn how to do a one-way analysis of variance (ANOVA) using a dataset that relates water flea (Daphnia spp.) growth rates to the presence and identity of three different parasites in a well-replicated manipulative experiment. Students will follow a specific workflow introduced in Chapter 5 of Beckerman et al. (2017): *Getting started with R: an introduction for biologists, 2nd edition*. Proceeding step-by-step in a directed tutorial, students will accomplish a core data visualization and analysis process they are likely to encounter frequently in their future careers. As the tutorial follows the organization of a specific book chapter, students will be able to read in more detail about any of the steps where they might get confused. They will then have a chance to analyze a similar dataset on their own in a follow-up homework assignment using an R Markdown document.

Learning objectives:

By the end of this lesson, students will be able to:

1. List the data structure, null hypothesis, assumptions, and typical data visualizations associated with one-way ANOVA;
2. List the appropriate workflow sequence for a given data analysis problem;
3. Manipulate data as needed to visualize relevant patterns using simple graphs (e.g., box plots);
4. Model data with a one-way ANOVA;
5. Check model assumptions with residuals plots;
6. Interpret the model output correctly, including a follow-up evaluation of treatment contrasts, if appropriate;
7. Create and export an aesthetically pleasing figure that accurately conveys the underlying data.

Lesson sequence:

1. Instructor introduces Swirl module
2. Students write out analysis workflow
3. Students work through Swirl module

4. Instructor provides summary and overview of lesson
5. Students complete associated R Markdown homework assignment

Pre-lesson activities:

Students will have already learned how to do basic data importation, manipulation, and visualization (with **ggplot2**) in R, and been introduced to simpler statistical analyses (e.g., chi-squared, *t*-test, and regression), from working through Chapters 1-4 and the first part of chapter 5 in Beckerman et al. (2017) *Getting started with R: an introduction for biologists, 2nd edition.*

Post-lesson activities:

Students will complete a follow-up homework assignment in R Markdown that reinforces their learning by having them complete a similarly structured, but more open-ended, data analysis exercise.

Implementation notes: None at the present time.