

Assignment 2

BIOL 2060 - Winter 2022

Due: Friday April 8, 11:59 pm

In this assignment, you will use R Studio to:

- Explore and test the assumptions of an analysis of variance (ANOVA)
- Carry out an ANOVA or non-parametric Kruskal-Wallis test on a dataset that includes four groups
- Carry out a post-hoc test (Tukey or Dunn)
- Interpret the results of your analyses
- Make a box plot of the data, with labels to indicate which means are different from each other based on the results of your post-hoc test.

Lecture 20 includes a demonstration of the R commands you will need for this assignment. You should review that material before you begin. On eClass you will find a text (.txt) file in tab-delimited format. Different versions of this file are available to different students; use the file that is visible to you when you log in to your own eClass account. In the file there are two columns of data, one for the explanatory variable and one for the response variable.

You are tasked with analysing the results of an experiment testing the efficacy of two new chemotherapy drugs in comparison to the drug currently marketed by your company. The response variable is the change in tumor size measured in grams. The explanatory variables are the different drug treatments: the currently used drug (control, labelled C), new drug A, and new drug B in two doses, low (B_L) and high (B_H). Your goal is to determine which of the drugs, if any, have a significant effect on the response variable, and in which direction, and whether either of the new drugs are strong candidates for potential use (after further testing of course!), while answering/doing the following based on the material presented in Lecture 20:

- 1)** What are the assumptions of ANOVA and are those assumptions met for your dataset? Include one graph in your answer with a brief explanation of what the graph demonstrates as well as the results of two sets of statistical analyses with single-sentence conclusions with respect to the null hypotheses.
- 2)** Perform either an ANOVA or Kruskal-Wallis test based on the results of **1)**. **Note:** you should ignore data transformations for the purposes of this assignment. Include your results in an appropriate table, as well as a single-sentence conclusion with respect to the null hypothesis and a single-sentence conclusion with respect to the scientific hypothesis (i.e., what can be concluded about the effect of the explanatory variable on the response variable?).
- 3)** Based on the results of **1)** and **2)** perform a post-hoc test, as appropriate. Include your results in an appropriate table, along with a single-sentence conclusion with respect to the null hypothesis and a 2–3 sentence conclusion with respect to the scientific hypothesis,

including your determination on which of the new drugs is a candidate for potential use, if any.

- 4) Display your data and results in an appropriately labelled boxplot. This includes letters above the box whiskers to indicate which means are different from one another (see Lecture 20).

Your assignment needs to be submitted through the Turnitin link on eClass by **11:59 pm on Friday April 8**. Your submission consists of two files: **1**. A word document or pdf containing complete answers to the four questions (this includes all tables and graphs); *and* **2**. An R script containing the complete set of commands used to complete the assignment.