[ST 518] Homework 8

1. **A person’s blood-clotting ability is typically expressed in terms of a “prothrombin time,” which is defined to be the interval between the initiation of the prothrombin-thrombin (two proteins) reaction and the formation of the final clot. Does aspirin affect this function? Measurements made before administration of two tablets and three hours after.**
   1. **Carry out a paired t-test of the hypothesis that prothrombin time is unaffected by aspirin.**

The paired t-test gave a p-value of 0.4748 which allows us to fail to reject the null, therefore, we have evidence that there is no significant effect on prothrombin time when taking aspirin.

* 1. **Carry out an F-test of the same hypothesis treating subjects as blocks in an analysis for a RCBD.**

The f-test gave a p-value of 0.7186 which leads to the decision to fail to reject the null. This is in agreement with the paired t-test that there is not significant effect on prothrombin time when taking aspirin.

* 1. **Show that, in general, the paired t-test is equivalent to the F-test for the RCBD with block size equal to 2.**
  2. **Consider the linear mixed effects model (or just “mixed model”)**
     1. **Show that E[MS(block)] =**

=

* + 1. **Use this result to estimate the variance component for subject effects in a mixed model for the prothrombin data.**
    2. **Report an estimate of the intra-subject correlation. Is the scatterplot above consistent with this estimate?**

The scatter plot shows a positive, slightly linear association which is consistent with a correlation of 0.757.

1. **For each of several species, an Ecology researcher ran an exposure assay in which groups of n = 50 ants are measured for mortality after exposure to one of three different bacteria. For each species, ants are randomized to the three bacteria treatments within each of 15 colonies. That is, a randomized complete block design is used for each species, with colonies serving as complete blocks. Find the results for the DB species on moodle as “DBdat.mtx”.**
   1. **Watch the video on the hiddenf package. What is the name of the function in R that will create a directory system containing all of the help files that a developer can complete to create documentation for a package?**

The R package is named “skeleton”.

* 1. **Obtain an interaction plot with proportion of ants dying out of n = 50 on the vertical axis, bacteria treatment on the horizontal axis and lines connecting mortality rates from the same colony.**

A graph of a number of columns

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* 1. **Either by using the hiddenf package in R, or by assigning colonies to groups, obtain an ANOVA table with the following sources of variability: treatments, groups, group-by-treatment interaction, colony within group.**

A screenshot of a computer

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* 1. **Obtain the p-value for the test of group-by-treatment interaction after and report it after multiplying by . Is there evidence that the resistance to bacteria varies across colonies?**

Because the p-value is low, we are able to reject the null hypothesis, therefore, there is evidence that the resistance to bacteria varies across colonies.

* 1. **Obtain another plot of survival versus bacteria with different lines for colonies. Color the colony lines according to group.**

**A graph of different colored lines

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