

New York University Tandon School of Engineering

Biomedical Engineering
Applied Mathematics and Statistics for Biomedical Engineering

Fall 2021

Professor Mirella Altoe
Tuesday 5:00-7:30PM Rogers Hall 325

Computer Lab Assignment #2

QUESTION 1: As in other vertebrates, individual zebrafish differ from one another along the shy–bold behavioral spectrum. In addition to other differences, bolder individuals tend to be more aggressive, whereas shy individuals tend to be less aggressive. [Norton et al. \(2011\)](#) compared several behaviors associated with this syndrome between zebrafish that had the *spiegeldanio* (*spd*) mutant at the *Fgfr1a* gene (reduced fibroblast growth factor receptor 1a) and the “wild type” lacking the mutation. The data below are measurements of the amount of time, in seconds, that individual zebrafish with and without this mutation spent in aggressive activity over 5 minutes when presented with a mirror image. Data available [here](#).

Wild type: 0, 21, 22, 28, 60, 80, 99, 101, 106, 129, 168

***Spd* mutant:** 96, 97, 100, 127, 128, 156, 162, 170, 190, 195

- A. Draw a boxplot to compare the frequency distributions of aggression score in the two groups of zebrafish. According to the box plot, which genotype has the higher aggression scores?
- B. According to the box plot, which sample spans the higher range of values for aggression scores?
- C. Which sample has the larger interquartile range?
- D. What are the vertical lines projecting outward above and below each box?

QUESTION 2: *Amorphophallus johnsonii* is a plant growing in West Africa, and it is better known as a “corpse flower.” Its common name comes from the fact that when it flowers, it gives off a “powerful aroma of rotting fish and faeces” ([Beath 1996](#)). The flowers smell this way because their principal pollinators are carrion beetles, who are attracted to such a smell. [Beath \(1996\)](#) observed the number of carrion beetles (*Phaeochrous amplus*) that arrive per night to flowers of this species. Data available [here](#).

- A. What is the mean and standard deviation of beetles per flower?
- B. What is the standard error of this estimate of the mean?
- C. Redraw the figure using the most appropriate method discussed in this chapter. What type of graph did you use? Give an approximate 95% confidence interval of the mean. Provide lower and upper limits.
- D. If you had been given 25 data points instead of 10, would you have expected the standard error of the mean to be greater than, less than, or about the same as this sample?