

BIOL343 – Assignment #9

Regression Model Deux

Assigned Sunday 29 March

Due Saturday 4 April 1159pm

Variation in relative brain size is commonly interpreted as the result of selection on neuronal capacity. However, brain size is likely correlated with body size which may be selected for a variety of other reasons. For this pop assignment, you are going to analyze the relations between brain size and body size for three mammalian orders that are probably subject to different selective pressures on both traits due to differences in locomotion (bats = powered flight, primates = primarily arboreal, carnivores = primarily terrestrial), the dimensionality of habitat and other aspects of ecology and behaviour.



You will begin the assignment by making some predictions concerning the extent to which the slopes and intercepts of the relative brain size body size regression should differ among these three mammalian orders, then you will test your predictions using model II regression.

The data are in: **Brains.csv**, which includes the following columns:

species = species

order = mammalian order (Carnivora, Chiroptera, Primates)

brain_mass_g = brain mass (in g)

body_mass_g = body mass (in g)

As usual, you will use **ggplot2** for graphs and **dplyr** functions whenever possible, and you'll use **smatr** for model II regression.

Here are your tasks:

(1) State your predictions about how the intercepts and slopes of the regression of brain size on body size should differ among the three mammalian orders. You DO NOT have to go to the literature to determine what the correct prediction is, simply state predictions that make sense to you and explain your reasoning in 1 or 2 brief sentences in the text section of your R notebook.

(2) Transform the data so that the regression lines describe proportional change in brain vs. body size. Because you'd like to compare intercepts among the three orders, you probably want to further transform one of the variables so that the intercepts make more sense. Brain size when body size = 0 doesn't make a whole lot of sense. Can you transform body size to remedy this?

(3) Before you launch into analysis, make an "exploratory" plot of the data (using different colours and symbols for each order, of course). The regression lines you plot on this graph don't have to be

model II nor do you need to make a caption for this figure. Do you foresee any problems with comparing slopes and elevations among these three mammalian orders?

(4) What are the two main approaches to model II regression that we discussed in lecture? Which do you think is appropriate for these data? Answer this question in the text of your R notebook.

(5) Using your chosen model II method, test whether the slopes of the regression of brain size on body size differ among the three mammalian orders. Use multiple comparisons to determine which pairwise differences between orders are significant. Describe the results with respect to your predictions stated above. Your conclusion should reflect any misgivings you have about this analysis.

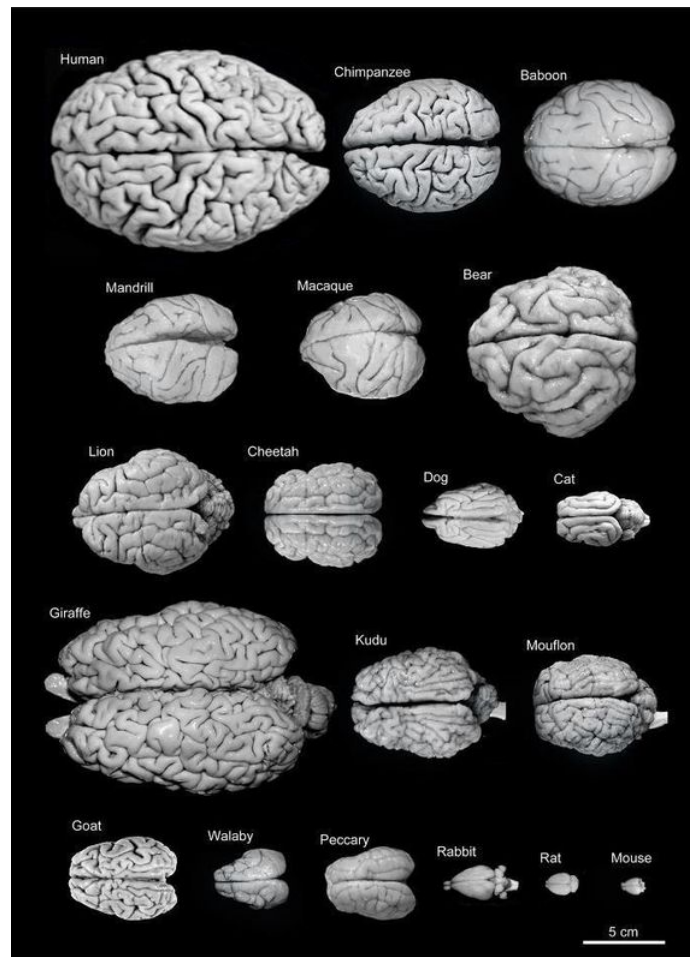
(6) Now, test whether the elevations of the regression differ among orders. While considering this question, take a close look at the output from the test of variation in slopes and the test of variation in elevations. If you find a significant difference in slopes, how does that change your interpretation of the variation in elevations? Answer this question in the text of your R notebook.

(7) Pick the model you feel is most appropriate (i.e. the MAM) and graph the data with the model II regression lines from the MAM. Lines for all orders should be plotted on the same graph. This should be a publication quality figure with a caption, which indicate the results of multiple comparisons between orders.

You will submit an **PDF version** of your .html R notebook document called "StudentNumber_A9.pdf", where the file name starts with your student number.

Please make sure that your PDF file is **complete** and as nicely formatted and organized as possible, paying close attention to all the formatting guidelines and tips provided for previous assignments.

You should upload your file to the Assignment #9 OnQ dropbox by Saturday 4 April at 1159pm.



If you run into difficulties you can ask questions during my online office hours (Wednesdays 130-230pm) and online tutorials (Thursdays 930-1020am and 1030-1120am). Good luck!!