

Why do we have large brains?

October 18 2017, by Shalene Singh-Shepherd

In recently published article from *Proceedings of the Royal Society B*, the relationship between brain size and behavioural ecology was found to be highly sensitive to small data changes, and widely championed hypotheses such as the Social Brain Hypothesis are often predicated on datasets which are not representative. We spoke to lead author, Lauren Powell, from Evolutionary Anthropology Research Group, University of Durham about these findings in her article "Re-evaluating the link between brain size and behavioural ecology in primates."

Tell us what your study was about and the findings of your paper?

Over the last 40 years many comparative studies have investigated the selection pressures responsible for variation in <u>brain size</u>. The proliferation of studies has not led to much consensus however, as results often contradict each other. In an attempt to get some definitive answers on which factors most robustly predict <u>brain size</u>, we conducted analyses on two large datasets, incorporating several commonly studied variables into our statistical models. Our results helped us to understand why it has been difficult to reach a consensus: the variables identified as significant predictors of brain size in our models were sensitive to the use of different <u>data sets</u>. Perhaps this should be no surprise, as estimates of behavioural variables such as home range size, diet composition and social group size are notoriously variable within species. Our study therefore represents a cautionary tale for comparative studies, especially where there is extensive intra-specific variation in behaviour. To the extent that we did find some consistency in results across data sets, this



was in greater support for hypotheses linking brain size to cognitive demands of foraging (through home range size, activity period and diet), with little support for the idea that brain size is linked to social group size, a correlation which has for several years formed the empirical basis of the social brain hypothesis. This does not necessarily mean that the social brain hypothesis is wrong, but it can no longer be assumed that there is strong evidence for it using this sort of approach.

How did you start working in this field?

I started with an undergraduate degree in Psychology and Linguistics with an interest in Speech and Language Therapy. During my degree, I became interested in the evolution of language and comparative approaches. Deciding that I wanted to stay in research to pursue these interests, I completed master's degrees in Neuropsychology and Human Evolutionary Studies with the ultimate aim of working in the field of brain evolution. I then joined Dr Bridget Waller's lab at the University of Portsmouth as a voluntary research assistant working on experimental comparative studies of Sulawesi crested macaques (Macaca nigra). I was fortunate enough to be awarded a Durham Doctoral Scholarship (DDS), which has supported my doctoral work at Durham University and our paper in Proceedings B.

What will you be working on next?

In addition to the problem of error in comparative data, one of our concerns about comparative studies of brain size is the latter variable: given that the brain contains diverse functional systems, how meaningful are behavioural correlates of overall brain size likely to be? With this issue in mind I am now examining the evolution of individual neural structures and systems. I am also investigating the link between the evolution and ontogenetic growth of specific brain structures, using new



data and phylogenetic techniques. I am very interested in examining the hypothesis that certain aspects of brain evolution are related to the complex serial ordering of behaviour, and am interested in what we can learn from non-primate species that either exhibit "complex" behaviours and/or are highly dextrous (procyonids, mustelids, cetaceans, proboscideans, psittaciformes, corvids, cephalopods). Having seen what can be achieved through touch screen training with non-human primates, I am also interested in experimental approaches to syntactic abilities.

More information: Lauren E. Powell et al. Re-evaluating the link between brain size and behavioural ecology in primates, *Proceedings of the Royal Society B: Biological Sciences* (2017). <u>DOI:</u> <u>10.1098/rspb.2017.1765</u>

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