# Electronic appendix accompanying the paper **“Big-brained birds survive better in nature”**

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## 1. SUPPLEMENTARY RESULTS

Brain size is considered less prone to error than body size, which is highly sensitive to nutritional and reproductive condition and varies considerably within individuals and among populations (Dunbar 1992). These errors in body mass could bias the results (Deaner et al. 2000), so we confirm here the relationship between brain size and mortality rate using an independent set of body masses as co-variate (Dunning 1993). At the population level, the negative relationship between brain and mortality rate holds when controlling for the independent set of body masses (-0.309 ± 0.098; $F_{1,81}$ = 9.76, $P$ = 0.0025, Supplementary Figure 1a), when both taxonomic and regional autocorrelations are accounted for with the GLMM approach. Indeed, at the broad scale of our analysis, the repeatability of our body mass samples is very high (n = 184 species, Pearson’s correlation = 0.998).

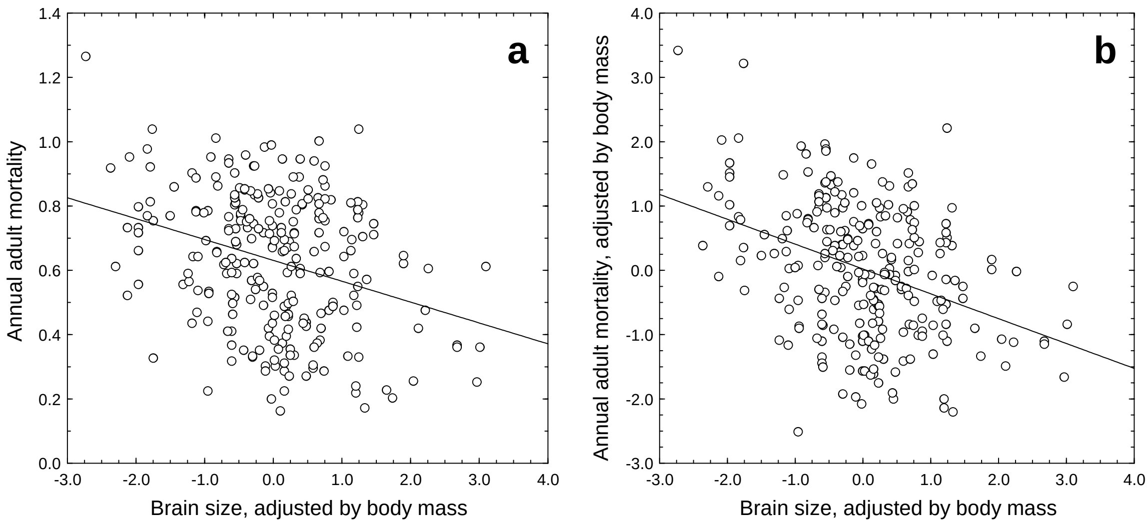


FIGURE 1. Relationship between brain residual index and mortality rate at the population level, without (a) and with (b) control of allometric effects of body size on mortality rates. Brain size adjusted by body mass is estimated as the residuals of a log-log least-square linear regression of brain mass against body mass. Body size effects were removed from mortality rates estimates using the same approach.

The conclusion that relative brain size is positively associated with adult mortality rate also holds at the species level, whether (least-square regression, slope ± s.e.m.: -0.418 ± 0.125;

$t_{147}$ = -3.32, $P < 0.001$) or not phylogeny (-0.497 ± 0.084; $t_{221}$ = -5.87, $P < 0.0001$) is controlled for with the method of independent contrasts. Likewise, families with larger relative brains have lower mean annual mortality rates than families with smaller brains (least square regression: $R^2 = 0.19$, $F_{1,41} = 9.45$, $P = 0.003$), a pattern that also holds when phylogenetic relationships are considered using independent contrasts ($F_{1,41} = 10.99$, $P <$ 0.002).

Body mass is not only correlated with brain mass, but also with virtually all aspects of life history. As larger birds exhibit lower annual mortality (GLMM, slope ± s.e.m.: -0.136 ± 0.018; $F_{1,81} = 54.50$, $P < 0.0001$), we also tested whether brain size is able to explain some of the variation that remains in mortality rate once the effect of body size has been removed (Allman et al. 1993; Deaner et al. 2000). To do so, we used as response variable the residuals of a log-log regression of mortality rate against body size. Since errors in body size would create a bias in the same direction in both response and predictor (Deaner et al. 2002), we used an independent set of body masses to remove body size effects of mortality rate and brain size. Having removed body size effects, mortality is still lower for species with larger brains than for those with smaller brains (GLMM, slope ± s.e.m.: -0.328 ± 0.697; $F_{1,60} = 21.97$, $P < 0.0001$; Supplementary Figure 1b), when both taxonomic and regional autocorrelations were accounted for.

## SUPPLEMENTARY REFERENCES


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