On the use of relative brain size - supplemental materials

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Methods

Sample size

The main text contained results for data sets with 100 species. To see how the models perform with a smaller or larger dataset, I simulated data for 20 and 1000 species, with 20 simulations per case and sample size.

Priors

The main text contained results for Bayesian models with slightly regularising priors. In emperical data sets, one can often choose more informative priors. To test the effect of this I analysed the dataset with 100 species with priors that only allow for positive slopes, with the mean set to the simulated value (1). I also restricted the priors for the intecept parameters to normal(0, 0.25).

To further test the robustness of the models I analysed the data with vague priors, settings intercept and slope to normal(0, 10) and standard variation parameters to exponential(0.1) (note that the mean for the exponential distribution is the inverse of the rate, such that the mean standard deviation here is 10).

Results

Sample size

Case I: relative brain size as response variable

Case II: relative brain size as predictor variable

Priors

Case I: relative brain size as response variable

Case II: relative brain size as predictor variable

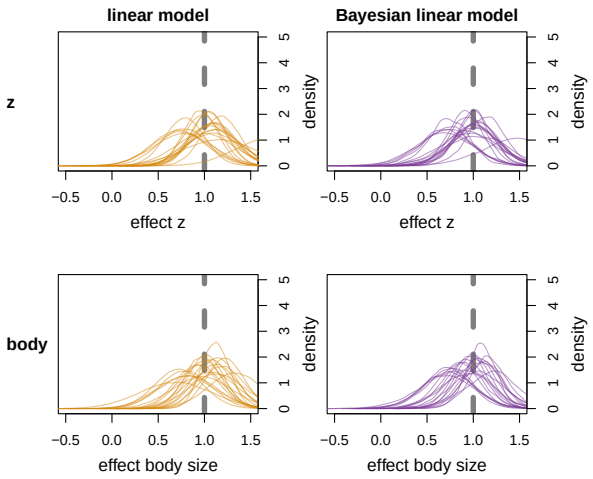

Figure 1: Model with sample size 20. Parameter estimates from the linear model and Bayesian linear model with brain size as response variable. Dashed grey line is the true value. Orange density plots are normal distributions based on the mean and SE from the linear model. Purple and green density plots are the posterior distributions from the Bayesian models.

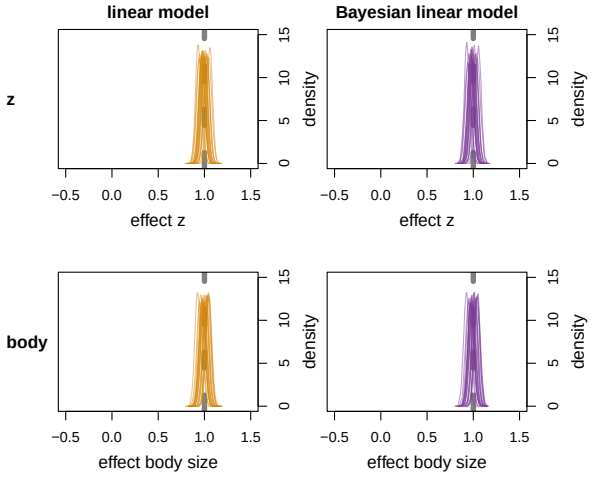

Figure 2: Model with sample size 1000. Parameter estimates from the linear model and Bayesian linear model with brain size as response variable. Dashed grey line is the true value. Orange density plots are normal distributions based on the mean and SE from the linear model. Purple and green density plots are the posterior distributions from the Bayesian models.

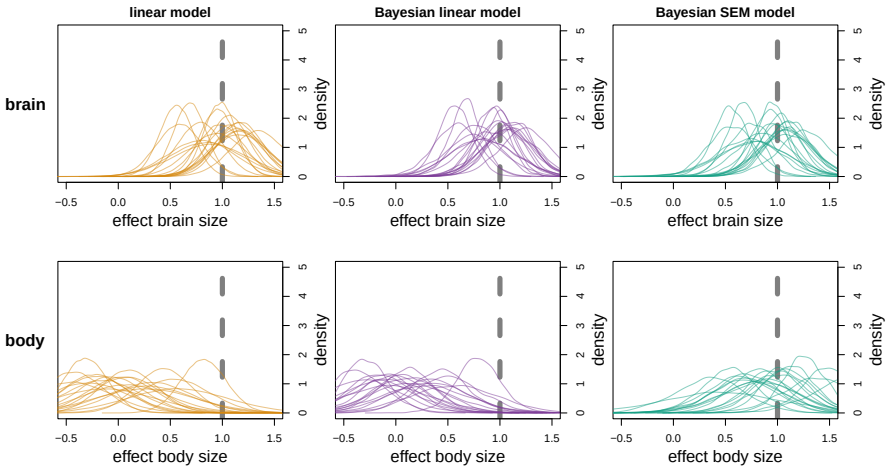

Figure 3: Model with sample size 20. Parameter estimates from the linear model, Bayesian linear model and Bayesian strucutral equation model (SEM) with relative brain size as predictor variable. Dashed grey line is the true value. Orange density plots are normal distributions based on the mean and SE from the linear model. Purple and green density plots are the posterior distributions from the Bayesian models.

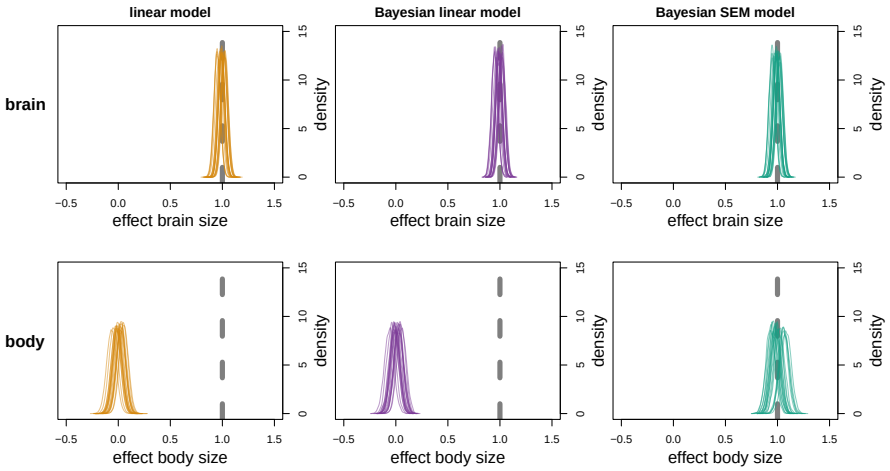

Figure 4: Model with sample size 1000. Parameter estimates from the linear model, Bayesian linear model and Bayesian strucutral equation model (SEM) with relative brain size as predictor variable. Dashed grey line is the true value. Orange density plots are normal distributions based on the mean and SE from the linear model. Purple and green density plots are the posterior distributions from the Bayesian models.

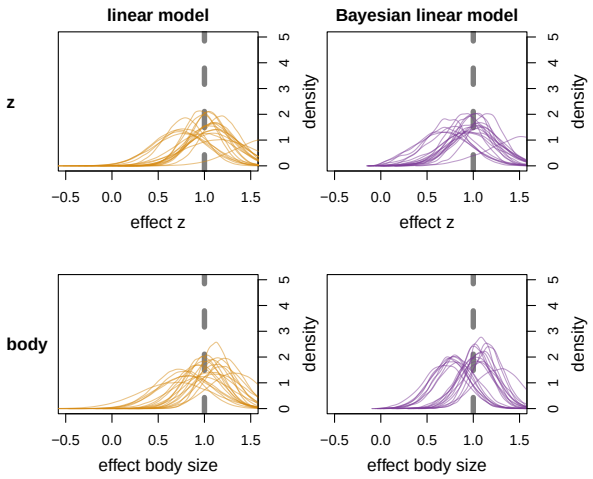

Figure 5: Model with informative priors. Parameter estimates from the linear model and Bayesian linear model with brain size as response variable. Dashed grey line is the true value. Orange density plots are normal distributions based on the mean and SE from the linear model. Purple and green density plots are the posterior distributions from the Bayesian models.

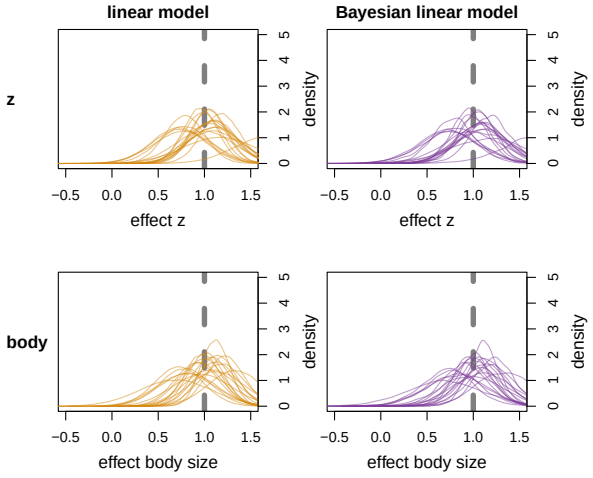

Figure 6: Model with vague priors. Parameter estimates from the linear model and Bayesian linear model with brain size as response variable. Dashed grey line is the true value. Orange density plots are normal distributions based on the mean and SE from the linear model. Purple and green density plots are the posterior distributions from the Bayesian models.

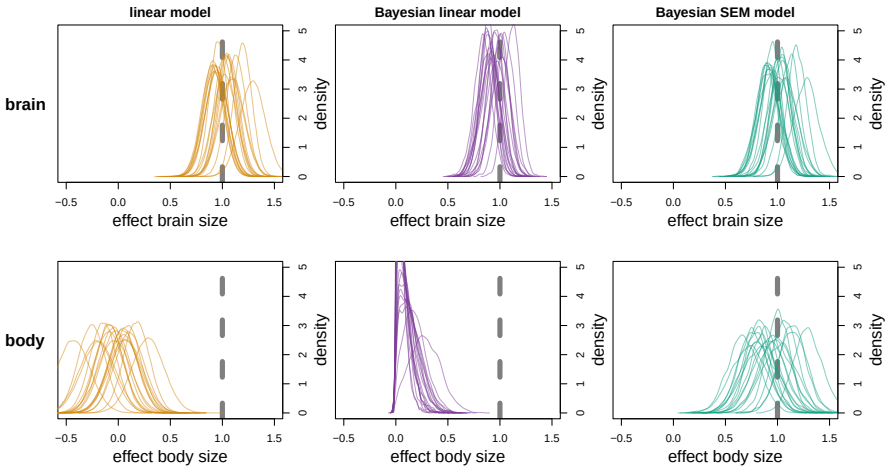

Figure 7: Model with informative priors. Parameter estimates from the linear model, Bayesian linear model and Bayesian strucutral equation model (SEM) with relative brain size as predictor variable. Dashed grey line is the true value. Orange density plots are normal distributions based on the mean and SE from the linear model. Purple and green density plots are the posterior distributions from the Bayesian models.

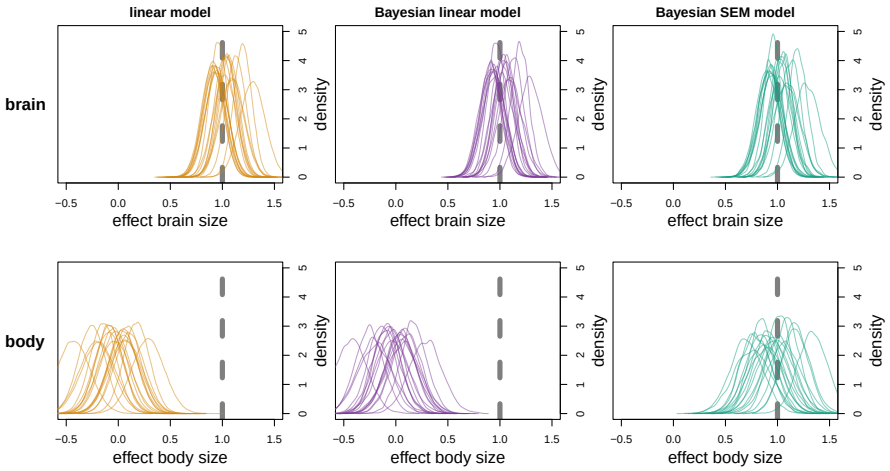

Figure 8: Model with vague priors. Parameter estimates from the linear model, Bayesian linear model and Bayesian strucutral equation model (SEM) with relative brain size as predictor variable. Dashed grey line is the true value. Orange density plots are normal distributions based on the mean and SE from the linear model. Purple and green density plots are the posterior distributions from the Bayesian models.