

Brain size associated with longevity

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Mammals with larger brains in relation to body size tend to live longer. This is the conclusion reached by researchers at the Centre for Ecological Research and Forestry Applications (CREAF), affiliated to Universitat Autňnoma de Barcelona, after having analysed almost 500 mammal species and obtaining new data on the relation between brain size and lifespan.

The <u>brain size</u> of some <u>mammals</u> is larger than expected for their body size. This is the case of large primates, such as chimpanzees and gorilla, and of whales, dolphins and elephants. Scientists have spent years investigating why sometimes nature favours the development of large brains given that they require much more time to reach functional maturity and use up so much energy. One of the classical explanations is the Cognitive Buffer Hypothesis (CBH). This hypothesis suggests that a



larger brain provides more flexibility in behaviour when facing changes in the environment and makes learning easier, aspects which allow species to overcome ecological challenges successfully.

CREAF researchers César González-Lagos and Daniel Sol, together with Simon Reader (University McGill, Canada), offer new data supporting this hypothesis in an article published recently in *Journal of Evolutionary Biology*. Using statistical methods, the authors analysed data from 493 mammal species - from rodents and bats to cetaceans, felines, ungulates and marsupials - and have reached the conclusion that having a larger brain entails having a longer life, and this represents a new advantage.

In addition to generating more opportunities to adapt to changes and therefore improving survival, a larger brain size also permits animals to live longer and thus have more chances to reproduce, which is beneficial to each individual member. This is the compensation for a longer embryonic development needed to generate a larger brain. Species with larger brains have also shown to take longer in reaching sexual maturity, which is in part compensated by a longer reproductive life.

The study includes an extended taxonomic range in comparison to previous studies and takes into account phylogenetic relations between species analysed. Researchers analysed a series of other variables which could be related to higher longevity, such as metabolic rates - the amount of energy expended while at rest - diet or habitat, and concluded that none of these can be significantly associated with <u>longevity</u>. Connections are made however not only with a larger brain size, but also with a larger body size, given that large animals are known to live longer. Nevertheless, CREAF researchers confirm that the size of the brain affects lifespan regardless of the size of the body. Hyenas, for example, have a larger brain than giraffes in proportion to <u>body size</u> and on average live longer, although they are smaller than these herbivores.



The statistical model used by researchers also took into account whether age registers of the almost 500 species analysed were carried out with animals living in the wild or in captivity. The latter were shown to have more chances of living longer.

The authors of the study emphasise that the relation between a large <u>brain</u> and a longer life is not always one of cause and effect. "CBH points to this fact, that a larger encephalon favours a longer lifespan, but it is equally possible that a longer life favours the development of larger brains", researchers assure. Thus, it is possible that a longer life works in favour of a delay in reproductive cycles and this would in turn allow progenitors to invest more resources and time in caring for their offspring. This also leads to the formation of stable social groups whose members, according to the Social Intelligence Hypothesis (SIH), must deal with more cognitive demands than animals living alone, and this would be the reason for larger brains. "Our results", researchers add, "do not demonstrate which of the two options is correct, although we think that the two complement each other and go hand in hand".

More information: C. González-Lagos, D. Sol, S. M. Reader (2010) "Large-brained mammals live longer". Journal of Evolutionary Biology, 23 (5), 1064-1074. <u>DOI: 10.1111/j.1420-9101.2010.01976.x</u>

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