Time management skills keep animals primed for survival

December 18 2014

Wild animals making decisions that need to be both fast and accurate. Credit: Daniel Rubenstein

Many animals may have a previously under-appreciated ability to make up for lost time with more effort, according to new research publishing this week in *PLOS Computational Biology*.

This capability could help scientists better understand how animals make

efficient decisions in changing environments—and ultimately help ensure the survival of a species.

Researchers from Princeton University challenge the conventional view that animals face a simple trade-off between the speed and the accuracy of their decisions. Adrian de Froment, Daniel Rubenstein and Simon Levin instead suggest that this picture of a two-way trade-off is missing a crucial third component: an ability to expend effort at a greater rate to compensate for any limit to the time spent making a decision.

The researchers use the theory of statistical decision-making to show that if an animal can control not only the time it invests in each decision, but also the amount of effort it invests within each unit of time, then it can swap effort for time as the situation demands. For example, if an animal comes under pressure to decide quickly, it can limit any loss in accuracy by expending more effort in the time that remains.

This flexibility gives an animal an advantage, in terms of Darwinian fitness, over individuals that are stuck with a simple trade-off between speed and accuracy, the researchers report. Because of this fitness advantage, the authors predict that the ability to control investment of time and effort separately should be widespread in nature.

Further work is needed to test this prediction, but if it is borne out, then this updated view of a three-way exchange between speed, effort per-unit-time, and accuracy could improve our understanding of efficient decision-making in all species, including humans.

More information: de Froment AJ, Rubenstein DI, Levin SA (2014) An Extra Dimension to Decision-Making in Animals: The Three-way Trade-off between Speed, Effort per-Unit-Time and Accuracy. *PLoS Comput Biol* 10(12): e1003937. DOI: 10.1371/journal.pcbi.1003937

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