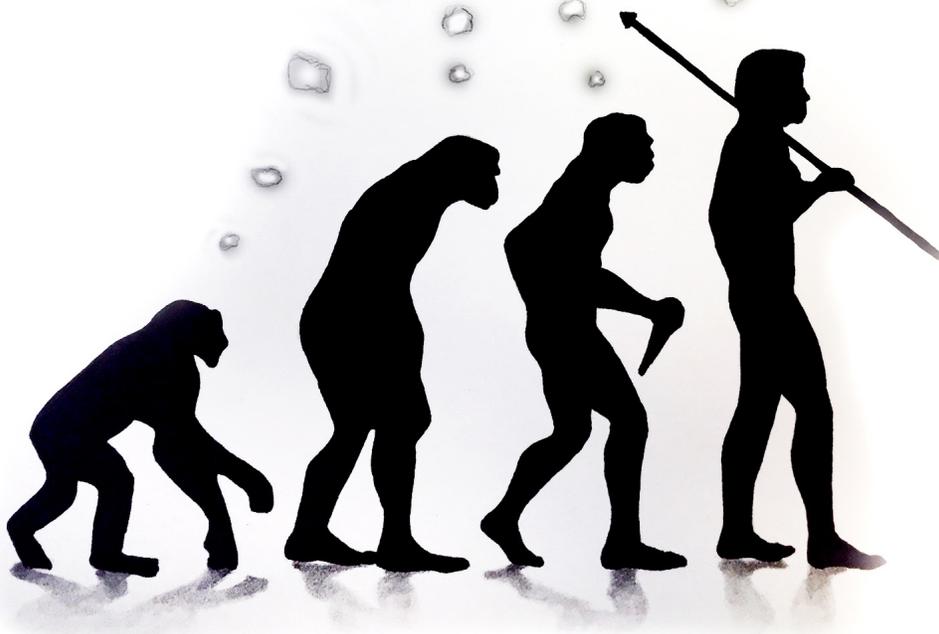


# The Evolution of *Irrationality*

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Aristotle defined man as a “rational animal,” meaning that human beings have the capacity to engage in rational thought and decision-making. Furthermore, he asserted that this “rational principle” that humans have is what separates humankind from all other animals [1]. The idea of humans as rational thinkers has continued from the time of the Greeks to present day and is especially invoked in the field of economics. In 1955, the economist Herbert Simon proposed the Expected Utility Theory, which asserts that the rational approach to making decisions is to weigh the benefits and costs of each decision and then choose based on which provides the best predicted outcome [2]. However, this expected utility theory is not practical and does not describe how humans really make decisions [3]. Real life decision-making includes the presence of influences like cognitive biases that causes humans to deviate from this rational framework.

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Cognitive biases are patterns of thought that create distorted perceptions that influence the decision-making process. One cognitive bias is called the framing effect, and it describes the idea that the different ways the same option is presented can influence how someone makes a decision. An example of the framing effect can be seen in a study where beef labeled as “75% lean” was rated healthier than the same beef labeled as “25% fat” [4]. This difference emerged even though the two labels were quantitatively equivalent. These cognitive biases are pervasive in human decision-making and make completely “rational” decision making impossible.

Recent research seeks to understand the evolution of these biases. Monkeys, being our most closely-related evolutionary relatives, are the research subjects for experiments assessing whether other animals also demonstrate cognitive biases. For example, in one study, monkeys prefer to be shown one piece of food and then given two pieces, rather than being shown three pieces of food and then given two pieces [5]. In humans, we experience the same bias, preferring choices framed as gains rather than losses [6]. Research seeks to determine whether or not cognitive bias in decision-making is unique to humans, which would suggest that these biases are socially determined. Comparative studies of framing and risk aversion in human and primate decision making present evidence implying that cognitive biases do, in fact, have a biological origin.

In a classic study of risky choice framing conducted by Kahneman & Tversky, participants were asked to make

decisions in a hypothetical situation about a disease epidemic. All participants were given the same information: without either program, 600 people would die. However, the way information was presented, how it was “framed,” was different. The scenario described two different programs to combat the disease; one which is riskier but may save more people, and the alternative, which doesn’t present any risk but may save less people. The information was either quantified in terms of how many people could survive, a “gain” condition/survival frame, or in terms of how many people could die, a “loss” condition/mortality frame (e.g. 200 people will survive vs. 400 people will die). Participants given the survival frame chose the safer program, where a constant number of people are always saved, more frequently. Participants given the mortality frame chose the riskier program, where there is a slight chance that all people will survive but also a greater chance that all the people will die, more often [6]. Beyond this study, ample research has been conducted that supports the conclusion that people are risk averse when a decision is framed as a gain and are risk seeking when a decision is framed as a loss [7].

Research with capuchin monkeys shows conclusions similar to studies done with humans. Of course, monkeys cannot be asked to evaluate a hypothetical scenario; instead, choices were set up in the context of food. In the “gain” condition, there were options between a safe amount of food and a risky amount of food. The safe presenter always showed the monkey one piece of food then added a piece of food. The risky presenter always

showed the monkey one piece of food and sometimes added two pieces. The monkeys preferred the safe presenter who always gave the same amount of food. In the “loss” condition, the safe experimenter always showed the monkey three pieces and took away one piece. The risky presenter, on the other hand, always showed the monkey three pieces and sometimes took away two pieces. In this case, the monkeys preferred the risky presenter [8]. Even though the amount of food given across multiple trials remained constant for both presenters, monkeys showed susceptibility to framing effects and the same loss aversion as their human counterparts.

The evidence of cognitive bias in both humans and our close phylogenetic relatives suggests that, though not rational, cognitive biases may have provided an evolutionary advantage to our early ancestors. At first, it’s a strange proposition that an irrational thinking process would be selected for by evolution. But, it’s important to realize that we name these thinking processes irrational based on the economic perception of what is rational. In nature, creatures try to maximize their fitness, the ability to survive and reproduce, and maximizing fitness might not always match up with maximizing utility. Expected Utility Theory states that all decisions should be made according to consistent preferences. However, it may be important for an ape to pay attention to context around them and make decisions based on inconsistent preferences [9]. For example, loss aversion may have been selected for in an environment with scarce food, since resource losses may result in starvation and matter more than resource gains.

This means it would be more biologically rational to analyze risk in terms of what can potentially be lost and avoid analyzing risk in terms of what can be gained [10].

Studies with monkeys also present evidence that suggests evolutionary selection of bias. More importantly, there are significant differences in the development of cognitive bias across different species of monkeys. For example, chimps live in a higher risk area than bonobos since they experience more seasonal variation and dependence on risky hunting. Therefore,

chimps display riskier behavior across all conditions, even when they are risk averse. This means that cognitive bias in different species may have adapted to their ecological environment [9]. The results also suggest that decision-making strategies are context-dependent, which has implications for human decision-making as well. For example, a comparative study of perceptual biases in a Namibian population and British population found that evidence of these biases differed between the two groups [13]. This corresponds to the idea of creatures evolving to the particular biological or social niche in which

they reside.

Evidence suggests that humans evolved to use cognitive bias in decision making. In fact, the presence of these behaviors in multiple species indicates that these “irrational” behaviors may in fact be rational in a biological and evolutionary context. While Aristotle may have defined man based on his rational cognitive abilities, evolution defined man based on irrationality. Therefore, only through exploring this irrationality can we discover what makes us truly human.



- [1] Aristotle. “Nicomachean Ethics.” *Nicomachean Ethics*. Trans. W. D. Ross. *Virtue Science*, 2016. Web. <http://www.virtuescience.com/ethics1.html#1.13>.
- [2] Simon, H. A.. (1955). A Behavioral Model of Rational Choice. *The Quarterly Journal of Economics*, 69(1), 99–118.
- [3] Kahneman D, Tversky A. 1979 Prospect theory: analysis of decision under risk. *Econometrica* 47, 263 – 291.
- [4] Levin, I. P., & G. J. Gaeth. 1988. “How Consumers are Affected by the Framing of Attribute Information Before and After Consuming the Product.” *Journal of Consumer Research* 15: 374-378.
- [5] Krupenye C, Rosati AG, Hare B. Bonobos and chimpanzees exhibit human-like framing effects. *Biol Lett*. 2015 Feb;11(2):20140527.
- [6] Tversky, Amos, and Daniel Kahneman. 1986. “Rational Choice and the Framing of Decisions”. *The Journal of Business* 59 (4). University of Chicago Press: S251–78. <http://www.jstor.org/stable/2352759>.
- [7] Kühberger A. The Influence of Framing on Risky Decisions: A Meta-analysis. *Organ Behav Hum Decis Process*. 1998 Jul;75(1):23-55.
- [8] Lakshminarayanan VR, Chen MK, Santos LR. 2011. The evolution of decision-making under risk: framing effects in monkey risk preferences. *J. Exp. Soc. Psychol*. 47:689–93
- [9] Santos LR, Rosati AG. The evolutionary roots of human decision making. *Annu Rev Psychol*. 2015 Jan 3;66:321-47. doi: 10.1146/annurev-psych-010814-015310. Review. PubMed PMID: 25559115; PubMed Central PMCID: PMC4451179.
- [10] Yexin Jessica Li, Douglas Kenrick, Vlasdas Griskevicius, and Steven Neuberg (2011), “The Evolutionary Roots of Decision Biases: Erasing and Exacerbating Loss Aversion”, in *NA - Advances in Consumer Research* Volume 38, eds. Darren W. Dahl, Gita V. Johar, and Stijn M.J. van Osselaer, Duluth, MN : Association for Consumer Research.
- [11] Cosmides, L., & Tooby, J. (1996). Are humans good intuitive statisticians after all? Rethinking some conclusions from the literature on judgment under uncertainty. *Cognition*, 58, 1–73.
- [12] Gigerenzer, G., & Hoffrage, U. (1995). How to improve Bayesian reasoning without instruction: Frequency formats. *Psychological Review*, 102, 684–704.
- [13] Caparos S, Linnell KJ, Bremner AJ, de Fockert JW, Davidoff J. Do local and global perceptual biases tell us anything about local and global selective attention? *Psychol Sci*. 2013 Feb 1;24(2):206-12