

Evolved altruism, strong reciprocity, and perception of risk

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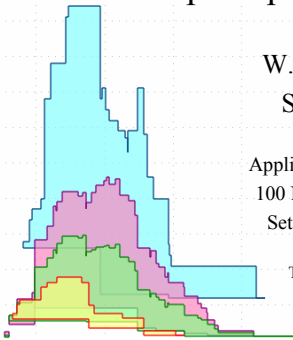
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Abstract

Humans have a long history of coping with particular recurring risks. We expect natural selection to have resulted in specific physiological and psychological adaptations that respond well to these risks. Why then does it seem so difficult to communicate risk in modern technological societies? We suggest that humans have been wired by natural selection to use a mental calculus for reckoning uncertainty and making decisions in the face of risk that can be substantially different from probability theory, propositional calculus (logic), or economic rationality (utility maximization). We argue that this is due to the unique armamentarium of strategies humans have evolved to cope with the risks faced during our long history living as hunter-gatherers. In particular, we believe the risk of social contract violation (not contributing a fair share to cooperative endeavors) was an important selective factor because reciprocity, reciprocal altruism, and cooperation are primary adaptations to the most important risks our hunter-gatherer ancestors faced. Important selective agents include uncertainty in food acquisition timing and quantity, pathogens, and risks from inter-group competition (including warfare).

Why is risk communication hard?

Experts often say that lay response to risk is irrational

But sometimes (often) people are good risk calculators

What risks are people *evolved* to perceive?



Hunting-gathering lifestyle

Deep time:

- 1st tools: 2.5 mya
- Paleolithic: 1.5 mya
- Anatomically modern: 150 kya
- Fully modern: 40 kya



Anthropology of risk



Pueblo Bonito in Chaco Canyon, NM

6 Risks:

- Accidents
- Subsistence failure
- Disease
- Inter-group competition (war)
- Cooperation failure (free riders)
- Paternity

Subsistence risk



875 - 1150 B.P.

Subsistence risk coping strategies

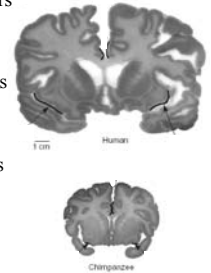
- Behavioral
- Physiological
- Social

Neuroscience of risk perception

The brain has many domain-specific calculators
(Marr 1982; Barkow et al. 1992; Pinker 1997, 2002)

Information *format* triggers specific calculators
(e.g. Cosmides & Tooby 1996; Gigerenzer 1991)

Different calculators give contrasting solutions
Or calculate different components of total risk
(e.g. Glimcher & Rustichini 2004 and references therein)



List of mental calculators

(after Pinker 2002)

- Language (grammar and memorized dictionary)
- Practical physics (pre-Newtonian)
- Intuitive biology (animate differs from inanimate)
- Intuitive engineering (tools designed for a purpose)
- Intuitive psychology (theory of mind, autism, deception)
- Spatial sense (dead reckoner and mental maps)
- Number sense (1, 2, 3, many)
- Probability sense (frequentist Bayes)
- Intuitive economics (reciprocity, trust, equity, fairness)
- Mental database and logic (assertions linked with logical and causal operators)

People are *bad* risk calculators



... or often *said to be* bad when

1. Presented with percentages, large numbers, or single-event probabilities
2. Experts tell them the risk
3. Presented with incertitude (versus variability)
4. Risk is seen to be imposed
5. Risk is out of personal control
6. Rare events are observed - representativeness
7. When children are at risk
8. etc.



When risk is imposed

... People perceive **more** risk
Even when the risk is smaller than voluntary risks

Multiple mental risk calculators perceive risk
Some perceive risk of disease, death, economic cost
Some perceive risk of social contract violation
(e.g. Cosmides 1989, Guth 1995, Henrich et al. 2005)
Bilateral anterior insula: disgust (e.g. Sanfey et al. 2003)

Ultimatum game

(from summary in Henrich et al. 2005)

Fairness, equity, justice trump “rationality”

- Mode usually 50%, mean 40-45%
- Half of responders reject 20%
- fMRI: rejectors are “disgusted” (Sanfey et al. 2003)

Widely replicated within and across societies

- 100’s of experiments
- 15 “traditional” economies

Variants – dictator, computer opponent, public goods

Anthropology of risk



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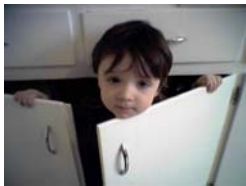
The problem of “altruism”

• Kin-directed altruism

(Hamilton 1964, Haldane)

- Explains social insects, parenting, nepotism

• How can non-relatives cooperate?



Cooperation with non-relatives

Reciprocal altruism

(Trivers 1971, Axelrod & Hamilton 1981)

2 problems: how to evolve, how to maintain

- Evolve is still not well understood
 - Prisoner's dilemma: Tragedy of the commons
- Maintaining cooperation requires 5 emotions (at least)
 - Friendship, moralistic aggression, forgiveness, guilt/shame, sympathy/gratitude

Risk of being cheated

- Social contract violation
- Wason selection task and logic
 - Evidence of cheater detection module: patterned violation of logical deduction
 - (Cosmides & Tooby, Gigerenzer & Hug)
 - Cheaters looked at longer, remembered better
 - (Chiappe, Brown, Dow, Koontz, Rodriguez, & McCulloch 2004; Mealey, Daood, & Krage, 1996; Oda, 1997)
 - Neuropsychology - Bilateral limbic system damage to temporal pole and amygdala impairs detection
 - (Stone, Cosmides, Tooby, Kroll, & Knight 2002)

Strong Reciprocity

- Ernst Fehr and Simon Gächter
 - team earns money when all cooperate
 - Punishers (moralistic aggression)
 - Spend money to ensure freeloaders don't prosper
 - Note – this is “irrational”.
 - People do pursue own self interest
 - But, definition of “self interest” includes fairness, equity, justice, prudence, generosity, etc.

Strong reciprocity (2)

- Human emotional constitution embraces prosocial and altruistic notions of in-group and out-group identification, and reciprocity
 - A direct result of evolutionary history
 - (Gintis 2005, Bowles and Gintis 2003)
 - Moral principles are “evolved facts in the world”
 - Evolved and transformed according to natural laws

Montauk guidance

When communicating risk, use knowledge of human design

- Use natural frequencies and natural formats
- Distinguish uncertainty and variability
- Fairness, justice, equity can trump utility
- Short and long term preferences reverse
- Risk averseness or prones are relative to need

When communicating risk, use knowledge of human variability

- Beware variation in numeracy
- Beware mental model variability
- Communicate benefit, cost, and risk to risk

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