Toulouse School of Economics

Evolution of Economic Behavior

TSE M1 – Semester 1

October 2019

Paul Seabright

Week 4: The Cognitive and Emotional Foundations of Cooperation.

Economics for the Common Good

The cognitive and emotional foundations of cooperation (I): Outline

- What’s needed for trust
- The key to our psychological trade-offs
- A view from behavioral economics
- Supporting evidence from neuroscience
- Conclusions: how is this evidence consistent with natural selection?

What’s needed for trust:

- It’s not enough to be good at spotting who can be trusted
- We also have to be good at inspiring trust in others
- High cognitive skills do not necessarily help us do this
- Kaushik Basu and the taxi driver
- Our solution:
    - An evolved cognitive AND emotional psychology
    - Trust in *institutions*

The key to our psychological trade-offs

- Cognitive capacities are exquisitely context-sensitive but no good for making commitment
- Recent evidence from experimental psychology and neurophysiology suggests *emotion* plays an important role in social cooperation, which was vital to our ancestors' survival
- It also suggests that many of the skills that promote cooperation are adapted modules of our brain, not just forms of general-purpose rationality
- Like chimps, we avoid violence when it doesn't pay – but we have more elaborate mechanisms to stop it from paying

A view from behavioral economics

- Cooperation needs discrimination PLUS commitment
- Three robust results from experimental behavioral economics:
- 1) Many (but not all) subjects are generous to strangers
- 2) Many (but not all) subjects display strong reciprocity
- 3) In repeated public goods games, cooperation starts positively but declines over time as subjects react negatively to others' free-riding – unless free-riders can be punished, even at a cost to the punishers!

From Henrich et al, “In Search of Homo Economics: Behavioral Experiments in 15 small-scale societies”, American Economic Review 2001

TABLE 1—THE ULTIMATUM GAME IN SMALL-SCALE SOCIETIES

Group	Country	Mean offer[a]	Modes[b]	Rejection rate[c]	Low-offer rejection rate[d]
Machiguenga	Peru	0.26	0.15/0.25 (72)	0.048 (1/21)	0.10 (1/10)
Hadza (big camp)	Tanzania	0.40	0.50 (28)	0.19 (5/26)	0.80 (4/5)
Hadza (small camp)	Tanzania	0.27 (38)	0.20 (8/29)	0.28 (5/16)	0.31
Tsimané	Bolivia	0.37	0.5/0.3/0.25 (65)	0.00 (0/70)	0.00 (0/5)
Quichua	Ecuador	0.27	0.25 (47)	0.15 (2/13)	0.50 (1/2)
Torguud	Mongolia	0.35	0.25 (30)	0.05 (1/20)	0.00 (0/1)
Khazax	Mongolia	0.36	0.25		
Mapuche	Chile	0.34	0.50/0.33 (46)	0.067 (2/30)	0.2 (2/10)
Au	PNG	0.43	0.3 (33)	0.27 (8/30)	1.00 (1/1)
Gnau	PNG	0.38	0.4 (32)	0.4 (10/25)	0.50 (3/6)
Sangu farmers	Tanzania	0.41	0.50 (35)	0.25 (5/20)	1.00 (1/1)
Sangu herders	Tanzania	0.42	0.50 (40)	0.05 (1/20)	1.00 (1/1)
Unresettled villagers	Zimbabwe	0.41	0.50 (56)	0.1 (3/31)	0.33 (2/5)
Resettled villagers	Zimbabwe	0.45	0.50 (70)	0.07 (12/86)	0.57 (4/7)
Achuar	Ecuador	0.42	0.50 (36)	0.00 (0/16)	0.00 (0/1)
Orma	Kenya	0.44	0.50 (54)	0.04 (2/56)	0.00 (0/0)
Aché	Paraguay	0.51	0.50/0.40 (75)	0.00 (0/51)	0.00 (0/8)
Lamelara[e]	Indonesia	0.58	0.50 (63)	0.00 (3/8)	0.00 (4/20)

Note: PNG = Papua New Guinea.

[a] This column shows the mean offer (as a proportion) in the ultimatum game for each society.

[b] This column shows the modal offer(s), with the percentage of subjects who make modal offers (in parentheses).

[c] The rejection rate (as a proportion), with the actual numbers given in parentheses.

[d] The rejection rate for offers of 20 percent or less, with the actual numbers given in parentheses.

[e] Includes experimenter-generated low offers.

Machiguenga	Peru	0.26	0.15/0.25 (72)	0.048 (1/21)	0.10 (1/10)
Hadza (big camp)	Tanzania	0.40	0.50 (28)	0.19 (5/26)	0.80 (4/5)
Hadza (small camp)	Tanzania	0.27 (38)	0.20 (8/29)	0.28 (5/16)	0.31
Tsimané	Bolivia	0.37	0.5/0.3/0.25 (65)	0.00 (0/70)	0.00 (0/5)
Quichua	Ecuador	0.27	0.25 (47)	0.15 (2/13)	0.50 (1/2)
Torguud	Mongolia	0.35	0.25 (30)	0.05 (1/20)	0.00 (0/1)

From Fehr & Gaechter, “Cooperation and Punishment in Public Goods Experiments”, American Economic Review 2000

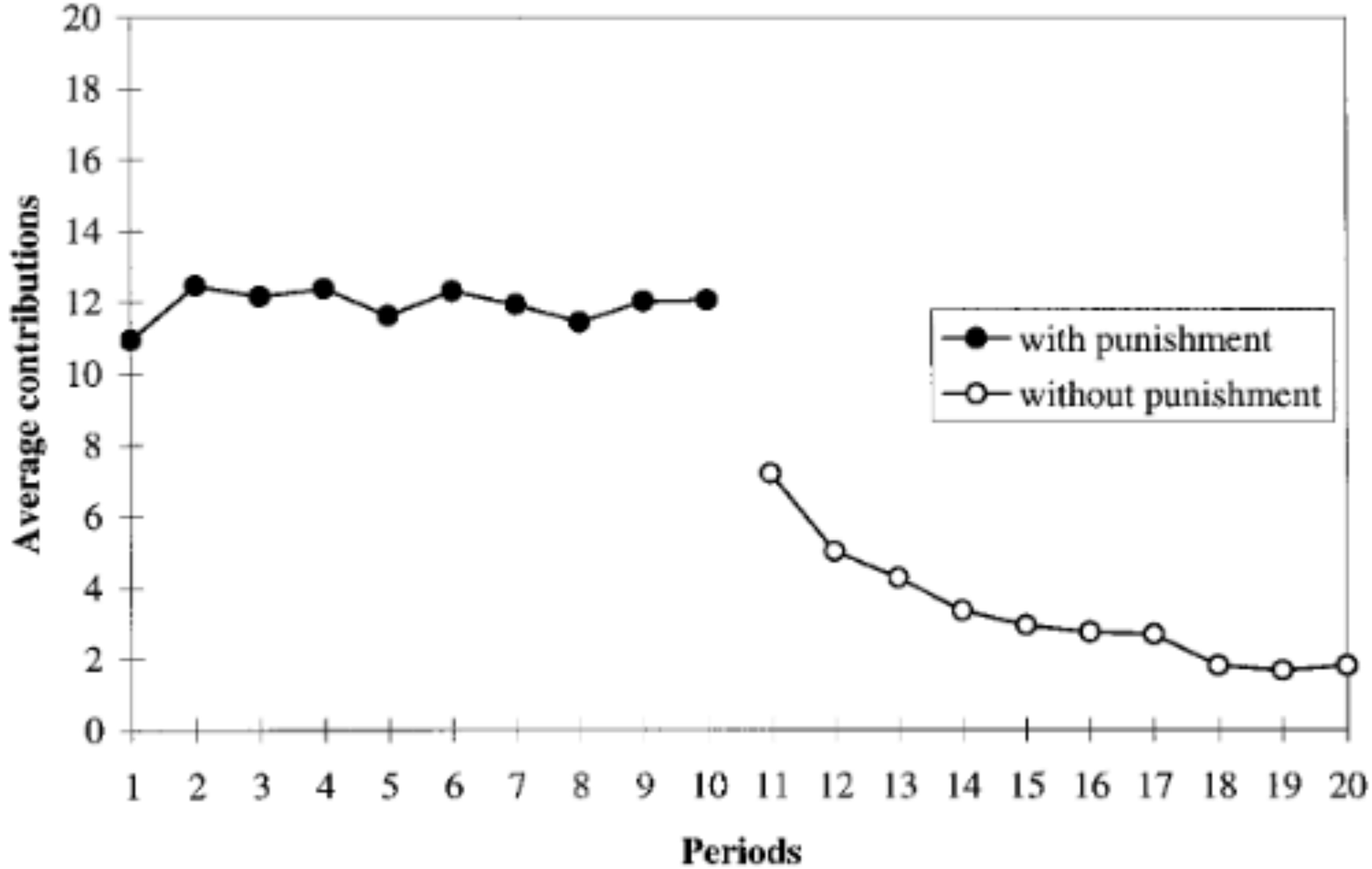


FIGURE 1A. AVERAGE CONTRIBUTIONS OVER TIME IN THE STRANGER-TREATMENT (SESSIONS 1 AND 2)

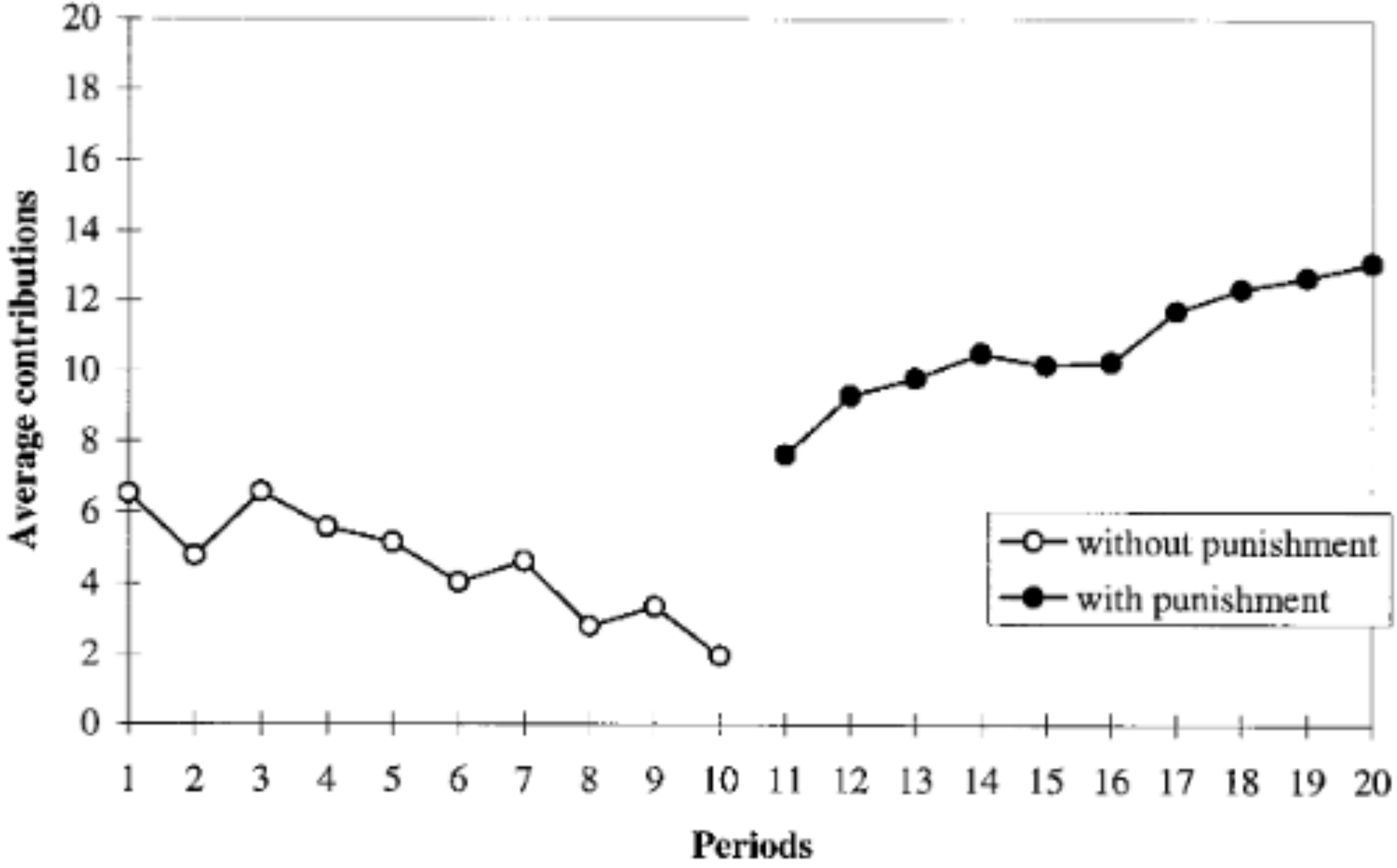


FIGURE 1B. AVERAGE CONTRIBUTIONS OVER TIME IN THE STRANGER-TREATMENT (SESSION 3)

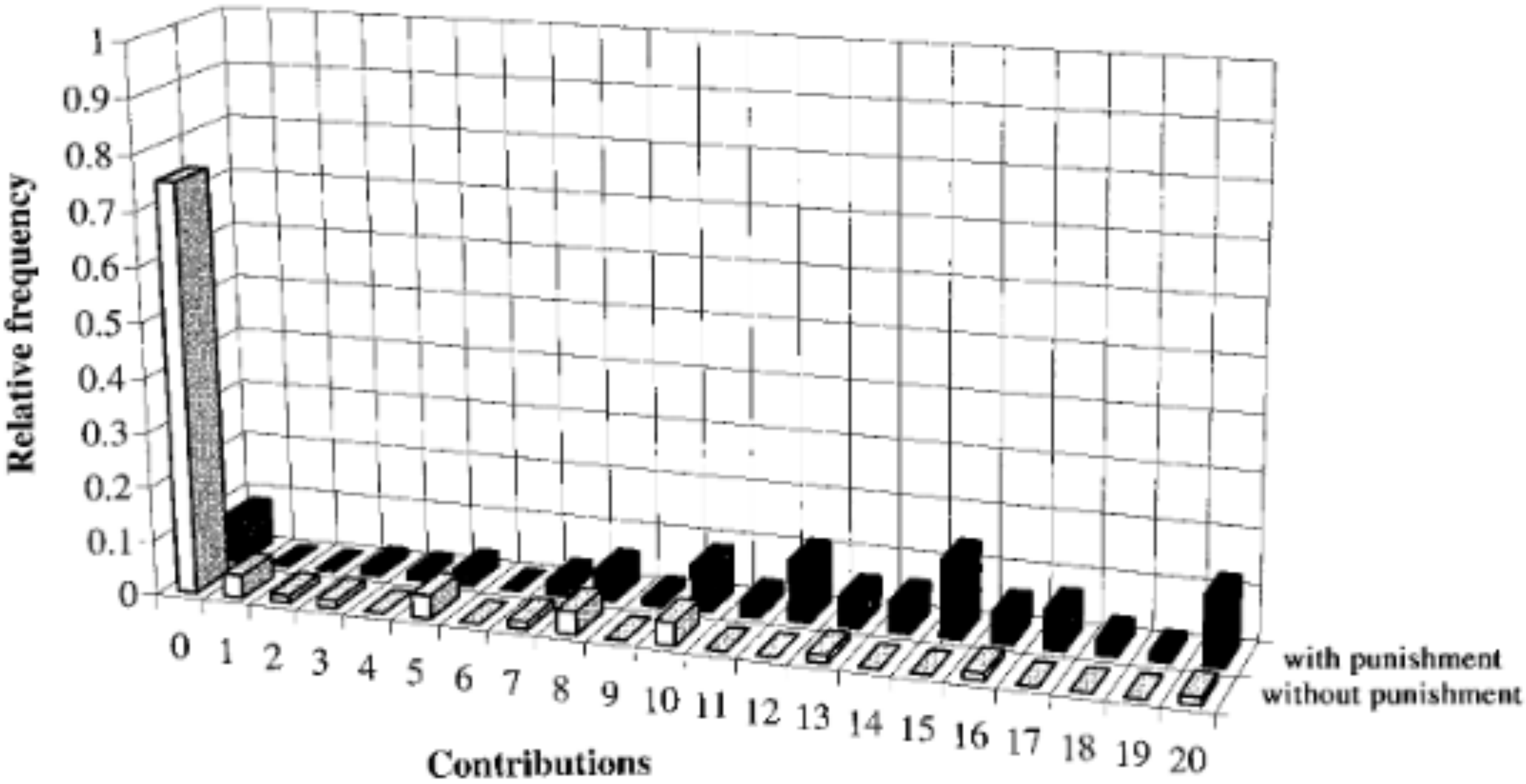


FIGURE 2. DISTRIBUTION OF CONTRIBUTIONS IN THE FINAL PERIODS OF THE STRANGER-TREATMENT WITH AND WITHOUT PUNISHMENT

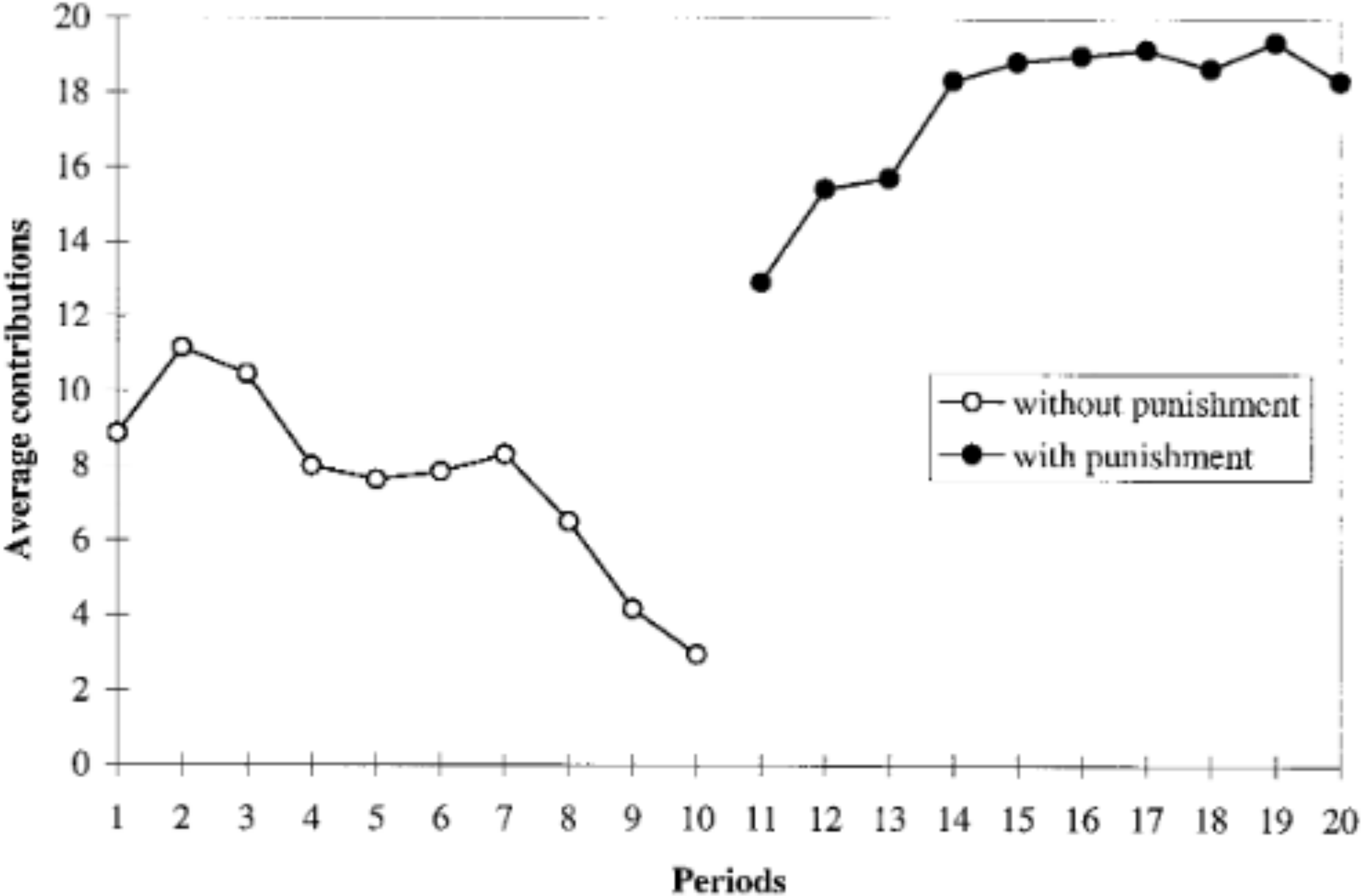


FIGURE 3B. AVERAGE CONTRIBUTIONS OVER TIME IN THE PARTNER-TREATMENT (SESSION 5)

Supporting evidence from neuroscience

- Commitment needs a neural mechanism
- Brain tissue is expensive, so our ancestors needed economical ways of encoding such behavior, either in cognitive short-cuts (for cheater detection) or in emotions (for commitment)
- Natural selection has repeatedly recruited existing neural machinery (eg homeostatic mechanisms) for strategic purposes (see Churchland: *Brain Trust*, Princeton 2011)
- Neuroscientific evidence is accumulating that commitment is linked with reward circuits in the brain

Anatomical separation of exploratory and exploitative decisions in the brain (Source: Dow et.al., Nature, June 15 2006)

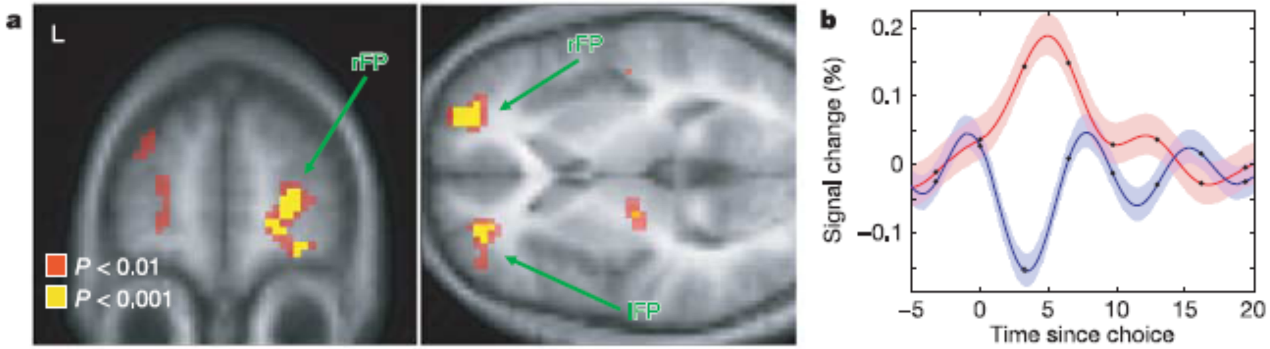


Figure 3 | **Exploration-related activity in frontopolar cortex.** **a**, Regions of left and right frontopolar cortex (lFP, rFP) showing significantly increased activation on exploratory compared with exploitative trials. Activation maps (yellow, $P < 0.001$; red, $P < 0.01$) are superimposed on a subject-averaged structural scan. The coordinates of activated areas are [−27,48,4, peak $z = 3.49$] for lFP and [27,57,6, peak $z = 4.13$] for rFP. **b**, rFP BOLD time courses averaged over 1,515 exploratory (red line) and 2,646 exploitative (blue line) decisions. Black dots indicate the sampling frequency (although, because sample alignment varied from trial to trial, time courses were upsampled). Coloured fringes show error bars (representing s.e.m.).

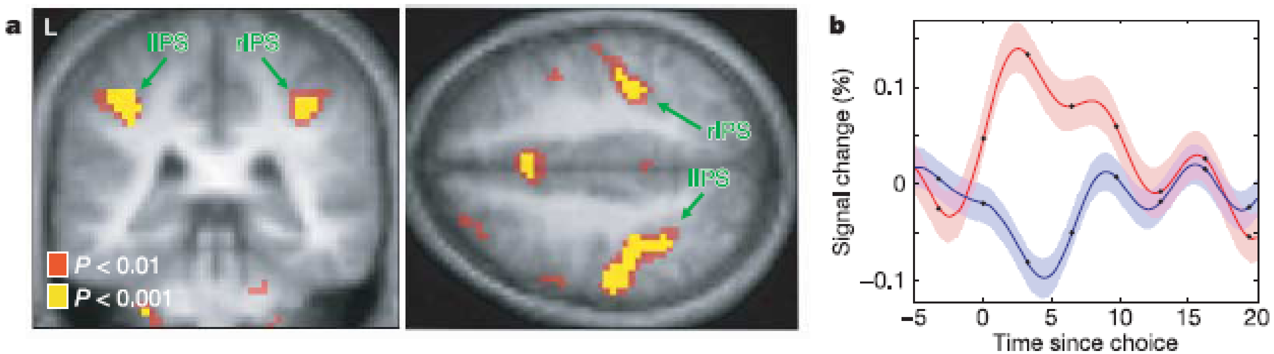
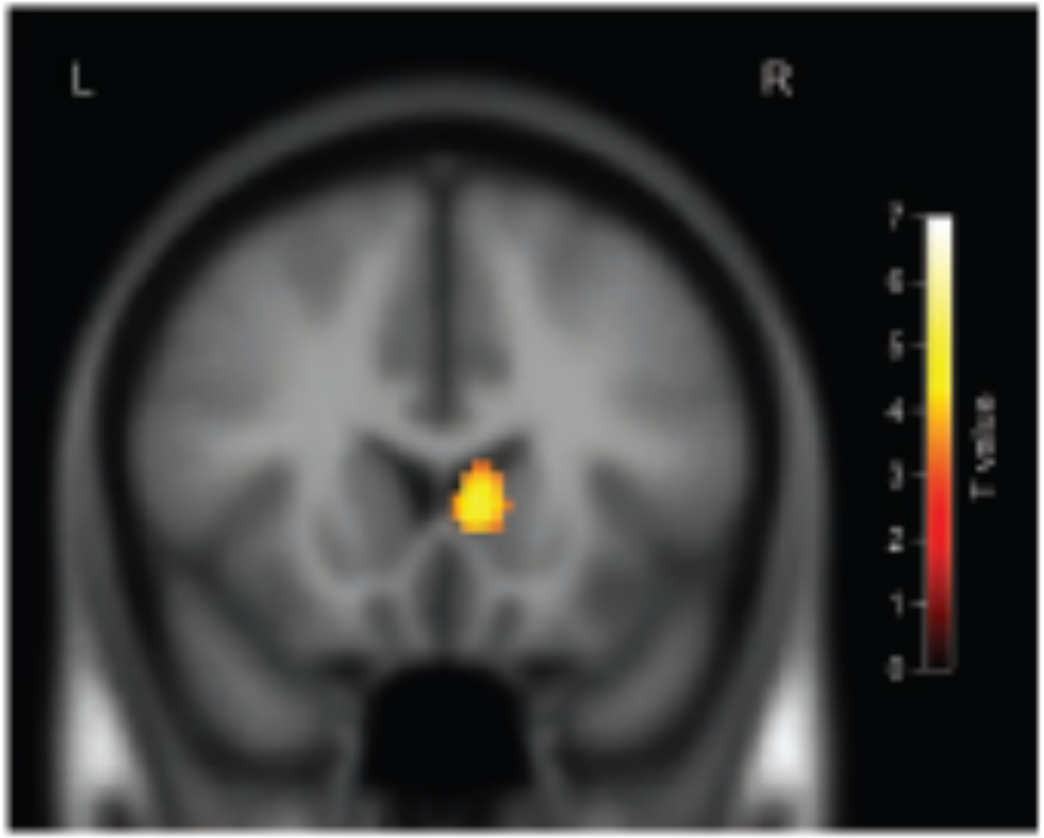


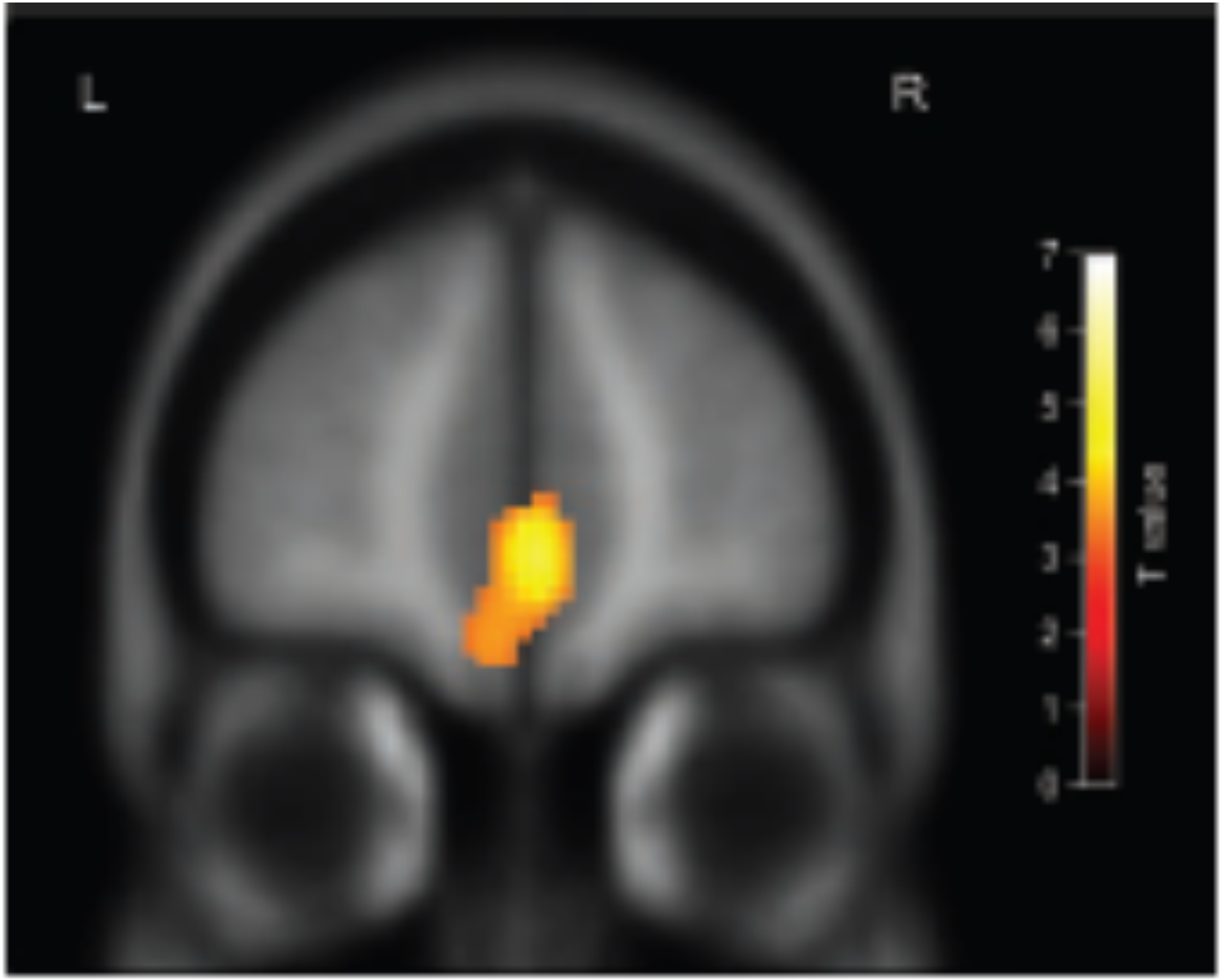
Figure 4 | **Exploration-related activity in intraparietal sulcus.** **a**, Regions of left and right intraparietal sulcus (lIPS and rIPS) showing significantly increased activation on exploratory compared with exploitative trials. Activation maps (yellow, $P < 0.001$; red, $P < 0.01$) are superimposed on a subject-averaged structural scan. The coordinates of the activated areas are [−29,−33,45, peak $z = 4.39$] for lIPS and [39,−36,42, peak $z = 4.16$] for rIPS. **b**, lIPS BOLD time courses averaged over 1,515 exploratory (red line) and 2,646 exploitative (blue line) decisions. Black dots indicate the sampling frequency (although, because sample alignment varied from trial to trial, time courses were upsampled). Coloured fringes show error bars (representing s.e.m.).

The neural basis of altruistic punishment
(Source: de Quervain et.al., *Science*, August 27 2004)

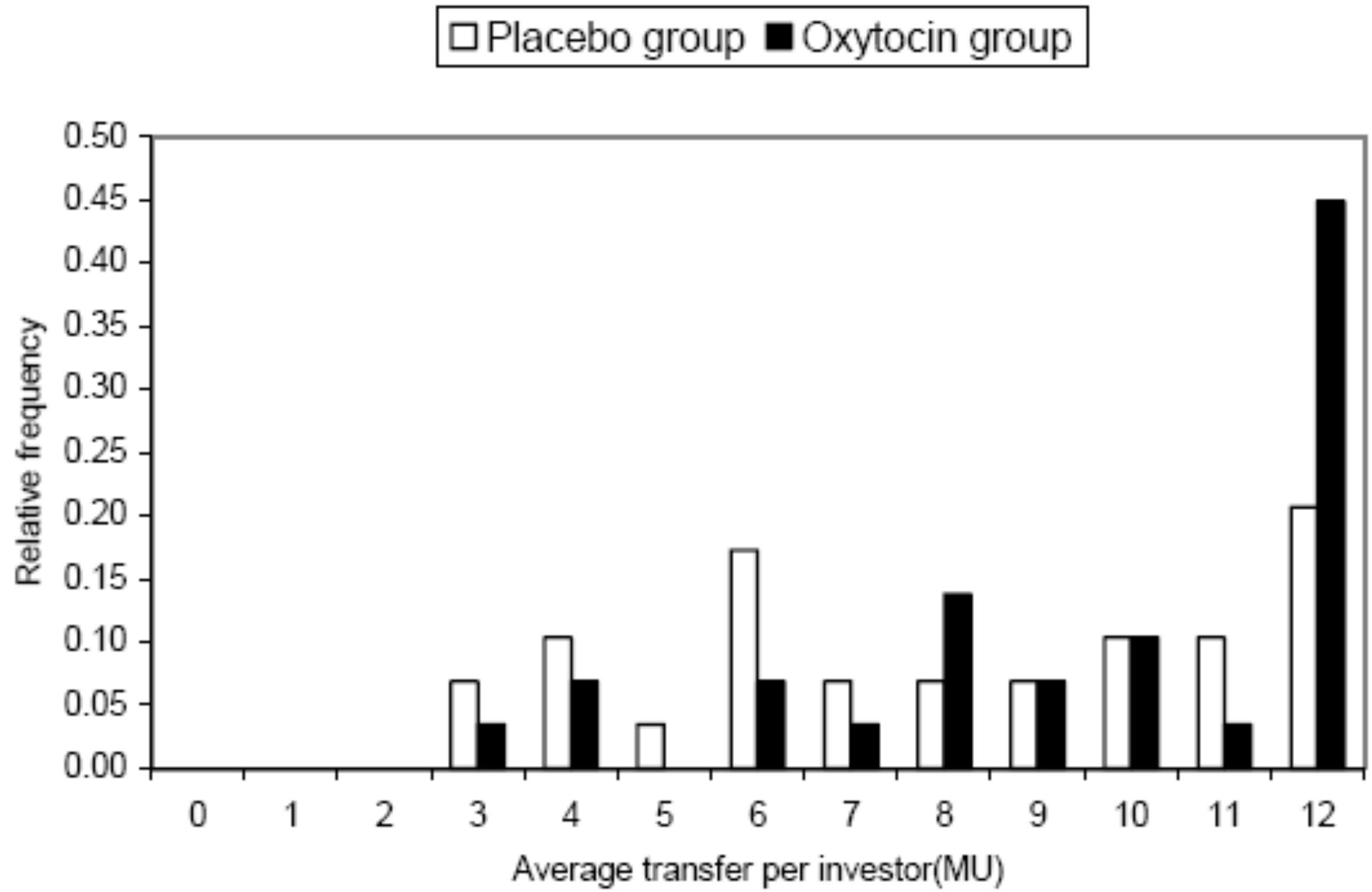
Activation in the caudate nucleus when subjects feel a strong desire to punish others for unfair behavior (compared to control when no such unfair behavior has taken place):



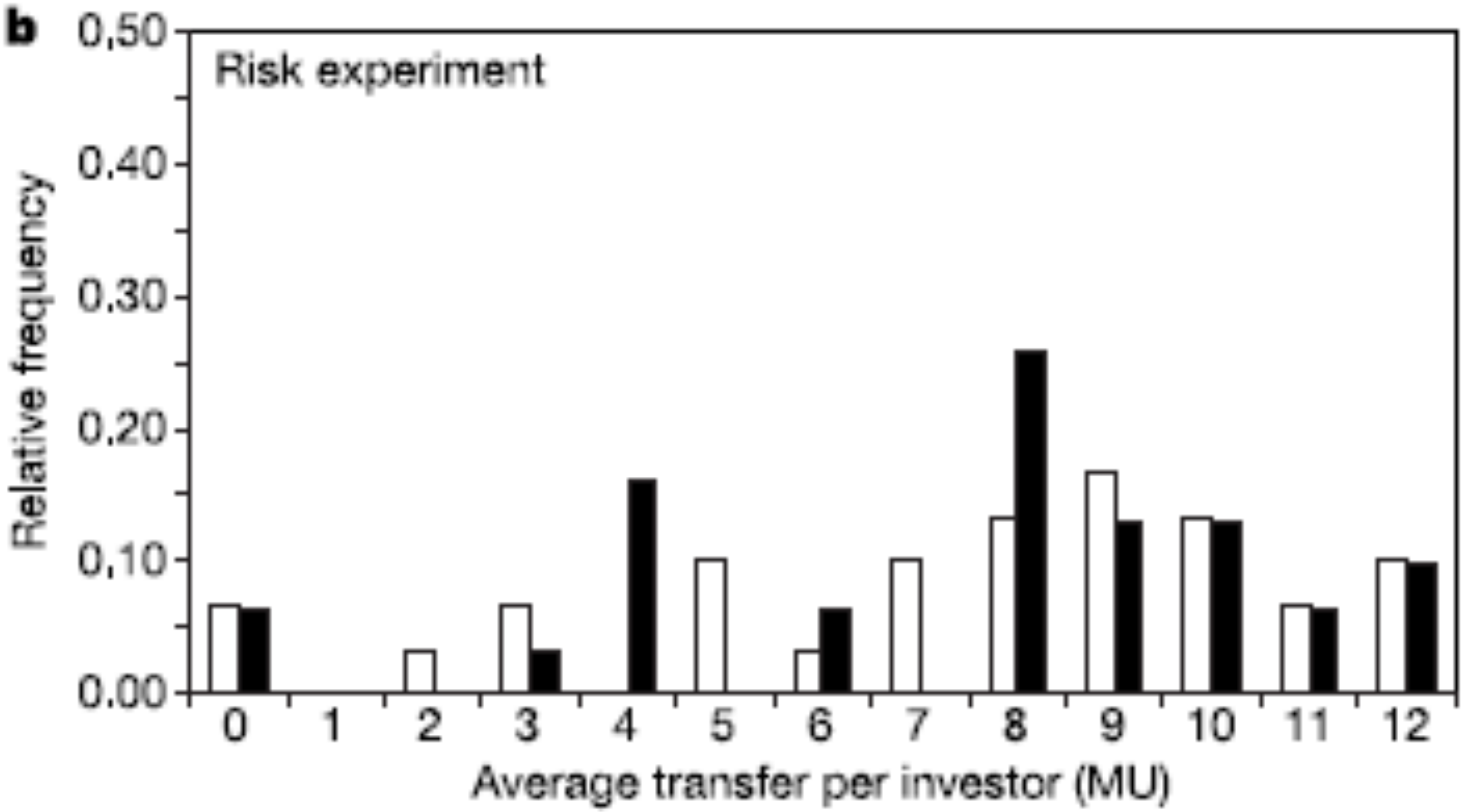
Activation in the prefrontal cortex when subjects know that punishing others will be personally costly to them (compared to control when desire to punish is present but punishment is not costly):



Oxytocin increases trust in humans
(Source: Kosfeld et.al., *Nature*, June 2 2006)



…and it's not about greater willingness to take risks: compare the same game played against a machine…



Conclusions

- Evidence from behavioral economics suggests that
  - Individuals care about their self interest and are strategic at pursuing it (and good at anticipating the behavior of others)
  - They also care about the welfare of others (are altruistic)
  - They are also motivated about strong reciprocity, responding to kindness with kindness and to betrayal with revenge
- Evidence from neuroscience suggests that
  - The brain implements cognitive short cuts – such as anatomically separating exploration and exploitation decisions
  - Social preferences (altruism,reciprocity) are anatomically encoded
- How can this be consistent with natural selection?

Toulouse School of Economics

Evolution of Economic Behavior

TSE M1 – Semester 1

October 2019

Paul Seabright

Week 4: The Cognitive and Emotional Foundations of Cooperation.

Economics for the Common Good