Toulouse School of Economics

Evolution of Economic Behavior

TSE M1 – Semester 1

October 2023

Paul Seabright

Week 5: The Cognitive and Emotional Foundations of Cooperation (continued).

Economics for the Common Good

Recapping: the explanation of declining violence from behavioral economics and neuroscience

- Reason has not *replaced* emotion but has *harnessed* it
- Purely cognitive approaches to the enforcement of trust cannot work (the reliability of the reprisal mechanisms depends on emotional components)
- In particular, trust is more effective in the presence of strong reciprocity
- But effectively designed institutions can make a little reciprocity go a long way

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

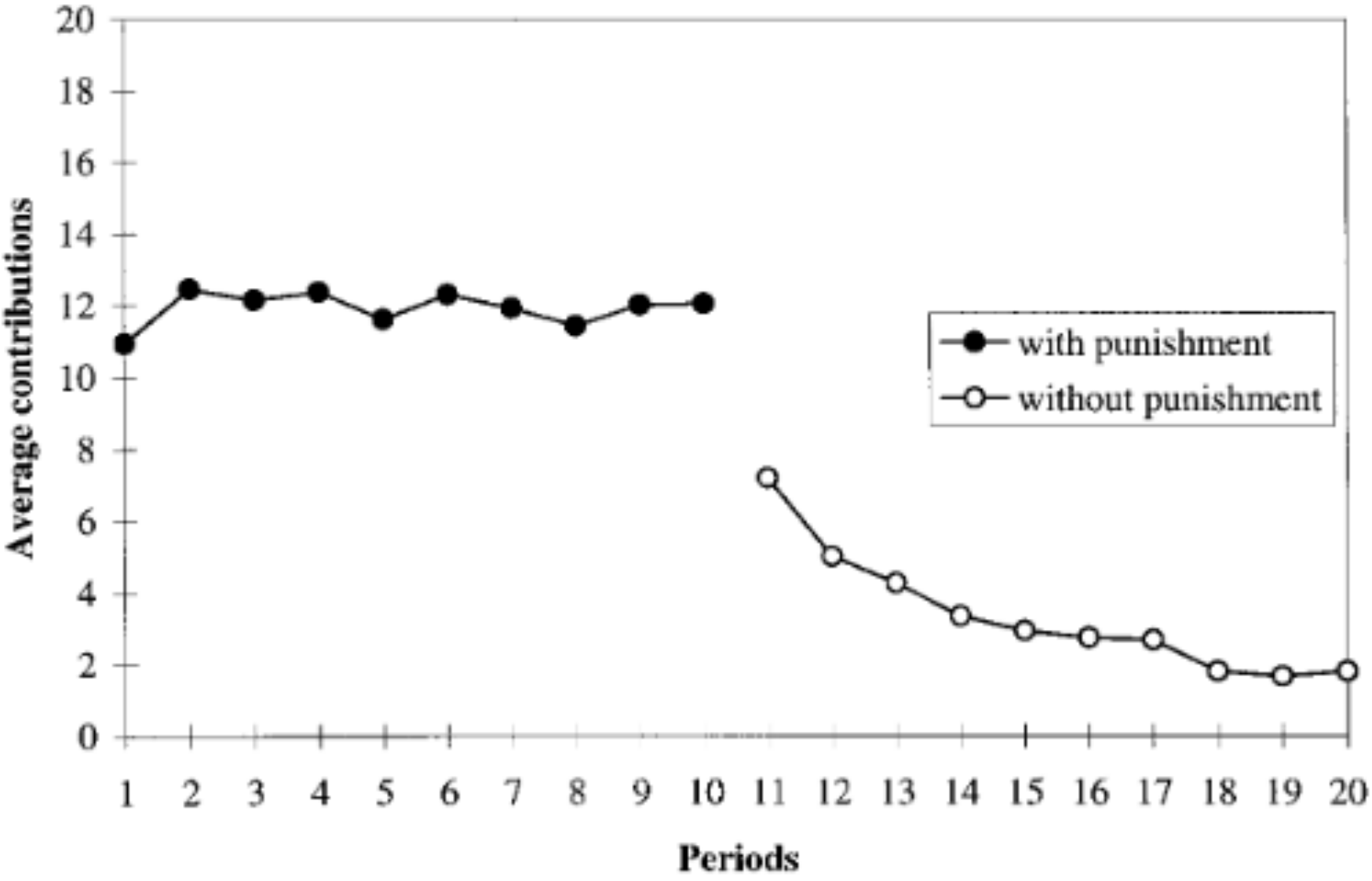


FIGURE 1A. AVERAGE CONTRIBUTIONS OVER TIME IN THE STRANGER-TREATMENT (SESSIONS 1 AND 2)

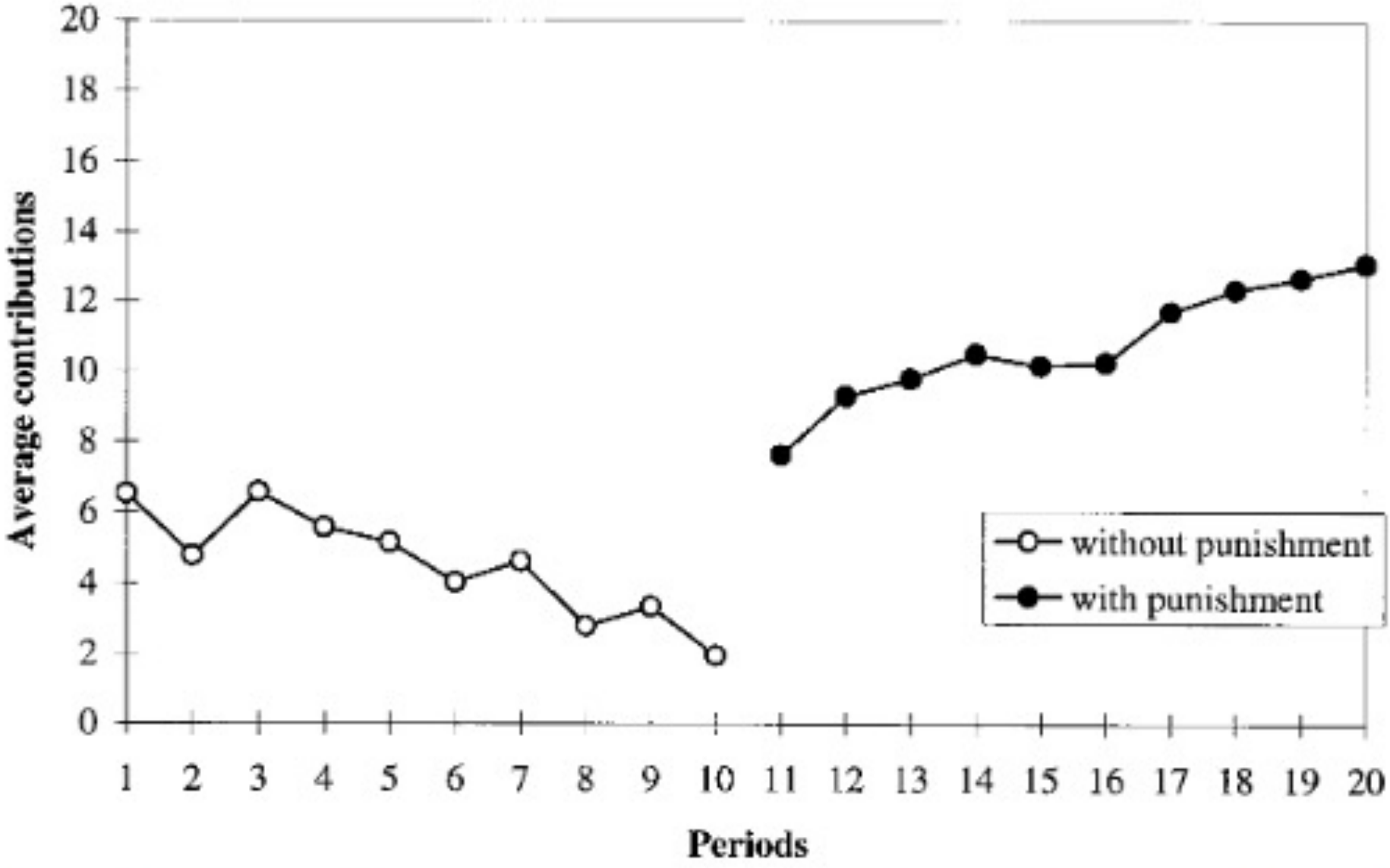


FIGURE 1B. AVERAGE CONTRIBUTIONS OVER TIME IN THE STRANGER-TREATMENT (SESSION 3)

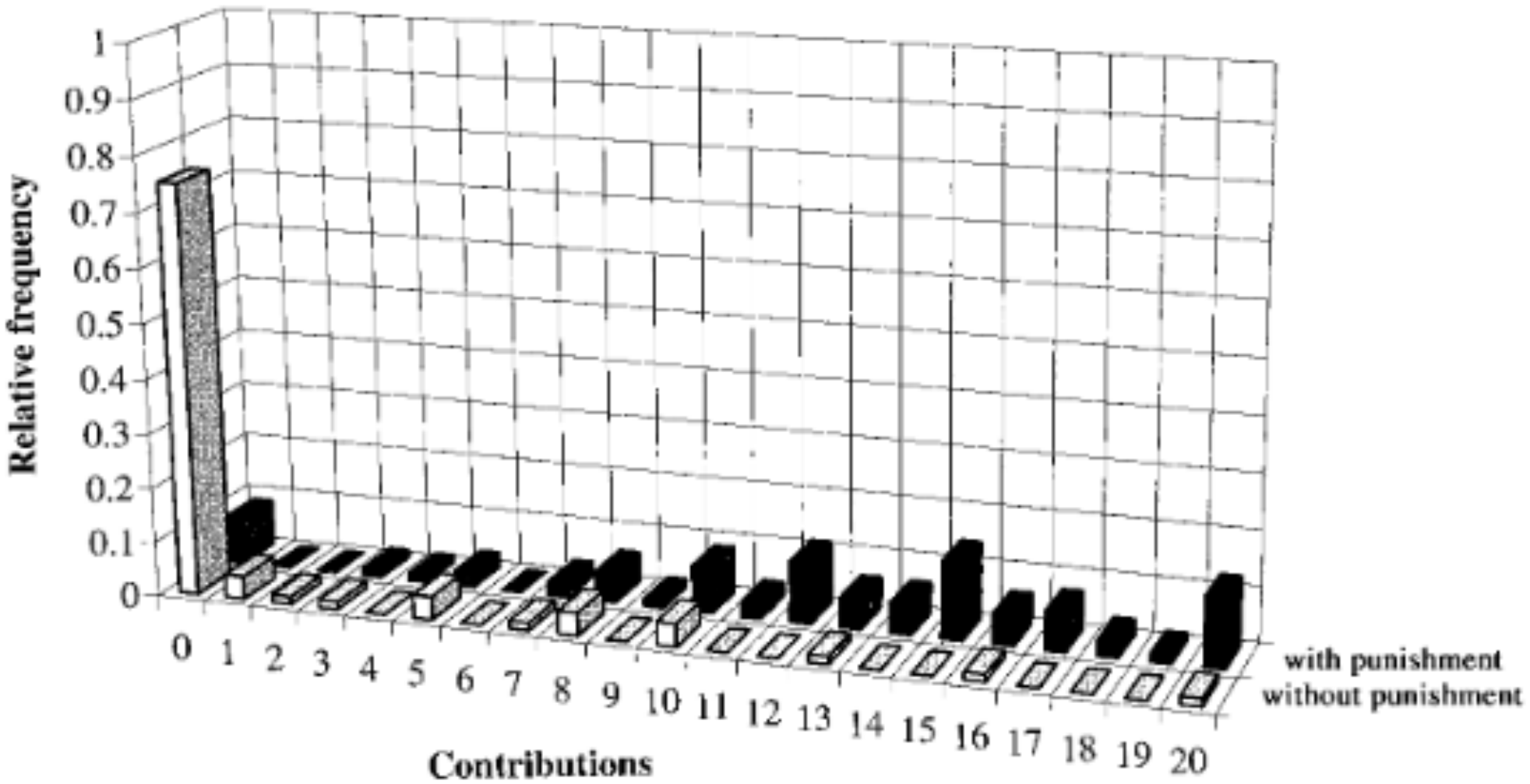


FIGURE 2. DISTRIBUTION OF CONTRIBUTIONS IN THE FINAL PERIODS OF THE STRANGER-TREATMENT WITH AND WITHOUT PUNISHMENT

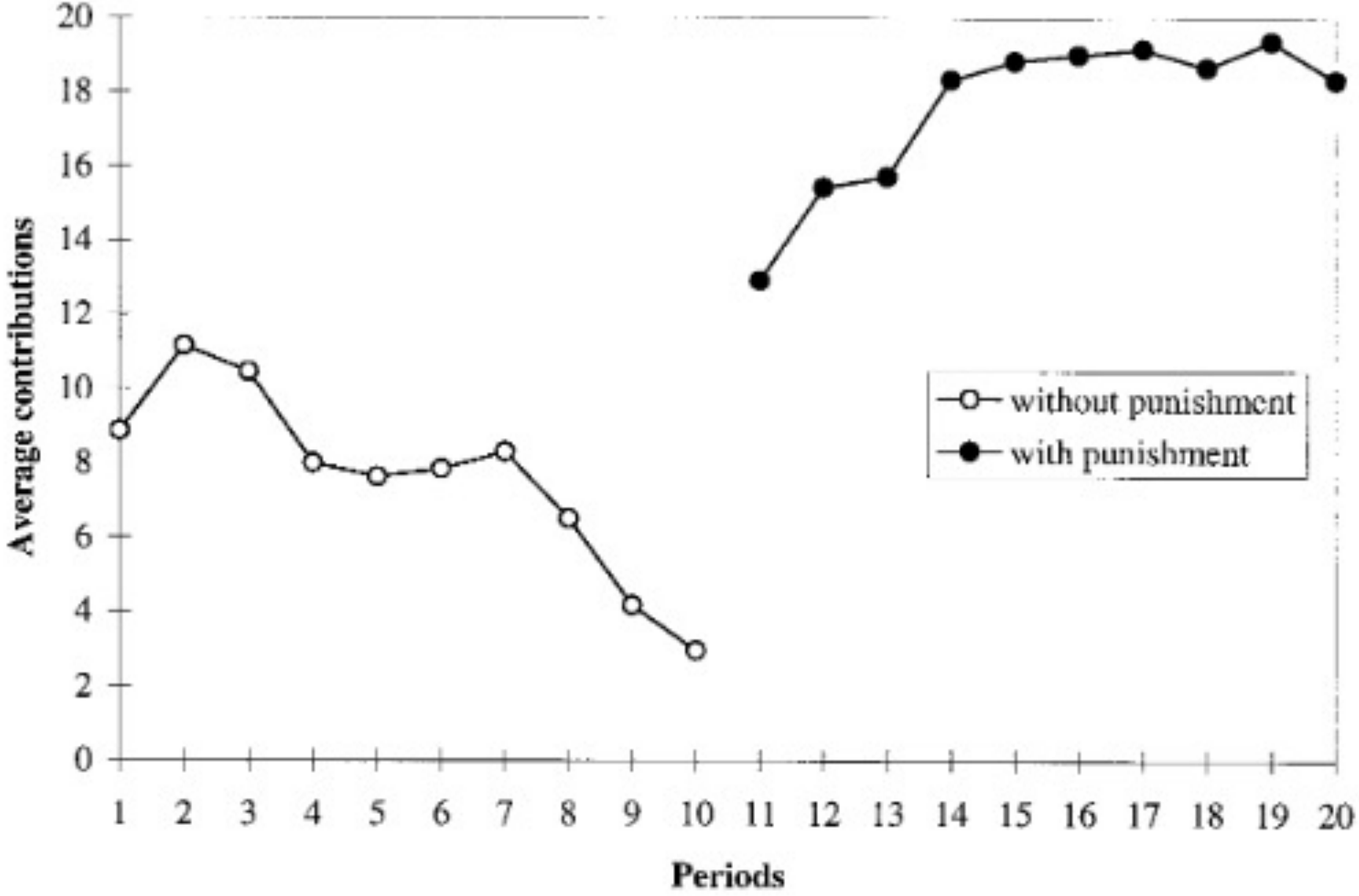


FIGURE 3B. AVERAGE CONTRIBUTIONS OVER TIME IN THE PARTNER-TREATMENT (SESSION 5)

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)

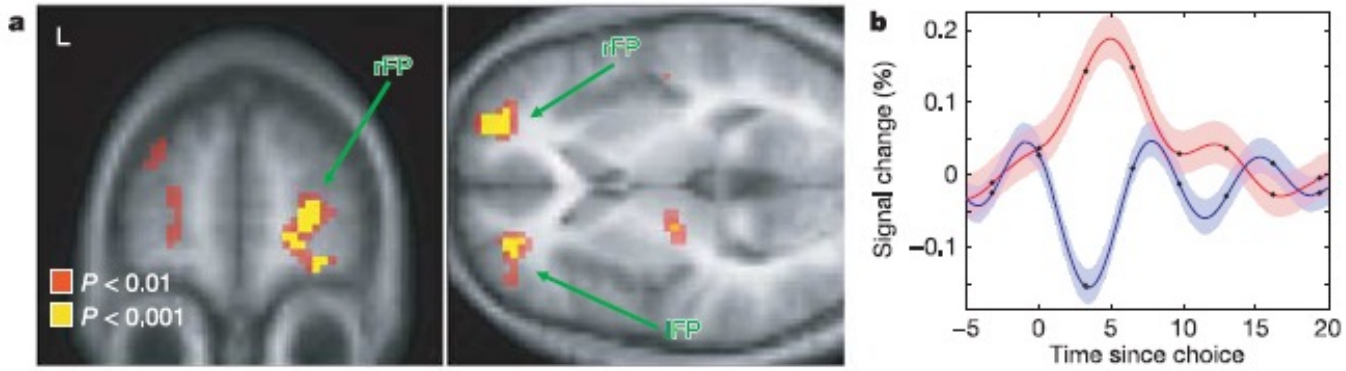


Figure 3 | Exploration-related activity in frontopolar cortex. **a**, Regions of left and right frontopolar cortex (lFP, rFP) showing significantly increased activation on exploratory compared with exploitative trials. Activation maps (yellow, $P < 0.001$; red, $P < 0.01$) are superimposed on a subject-averaged 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.).

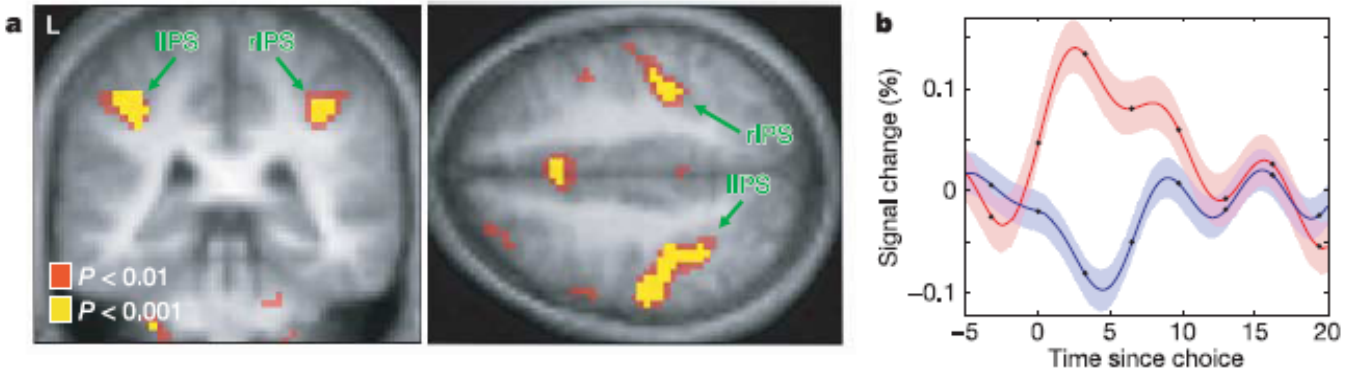
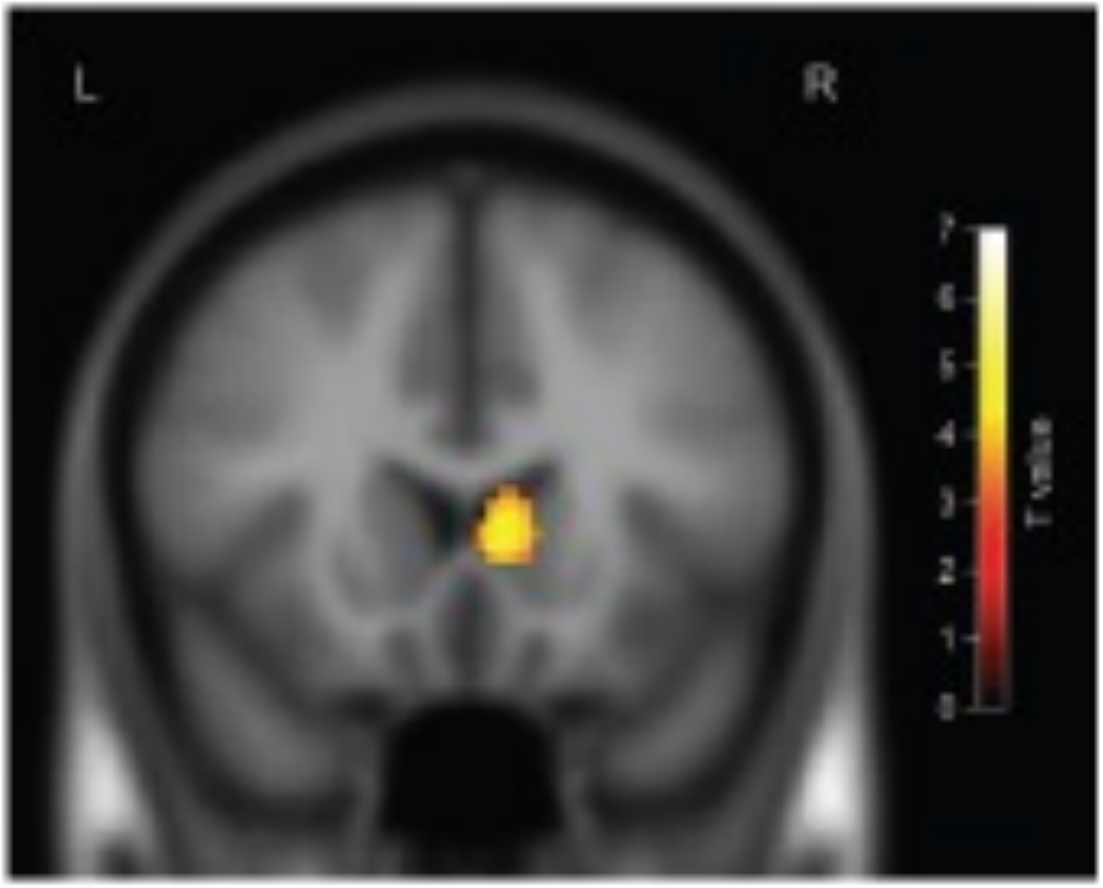


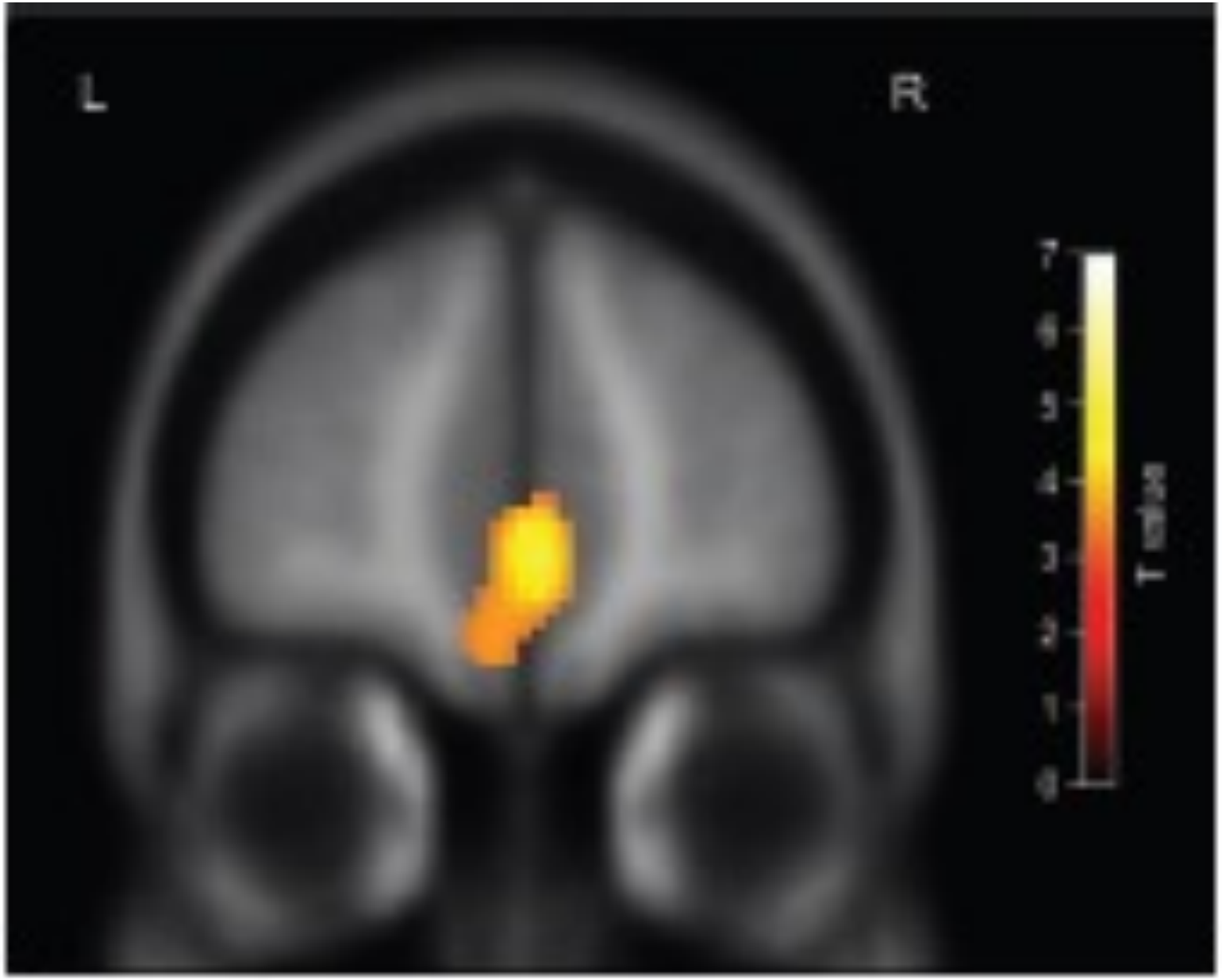
Figure 4 | Exploration-related activity in intraparietal sulcus. **a**, Regions of left and right intraparietal sulcus (lIPS and rIPS) showing significantly increased activation on exploratory compared with exploitative trials. Activation maps (yellow, $P < 0.001$; red, $P < 0.01$) are superimposed on 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):

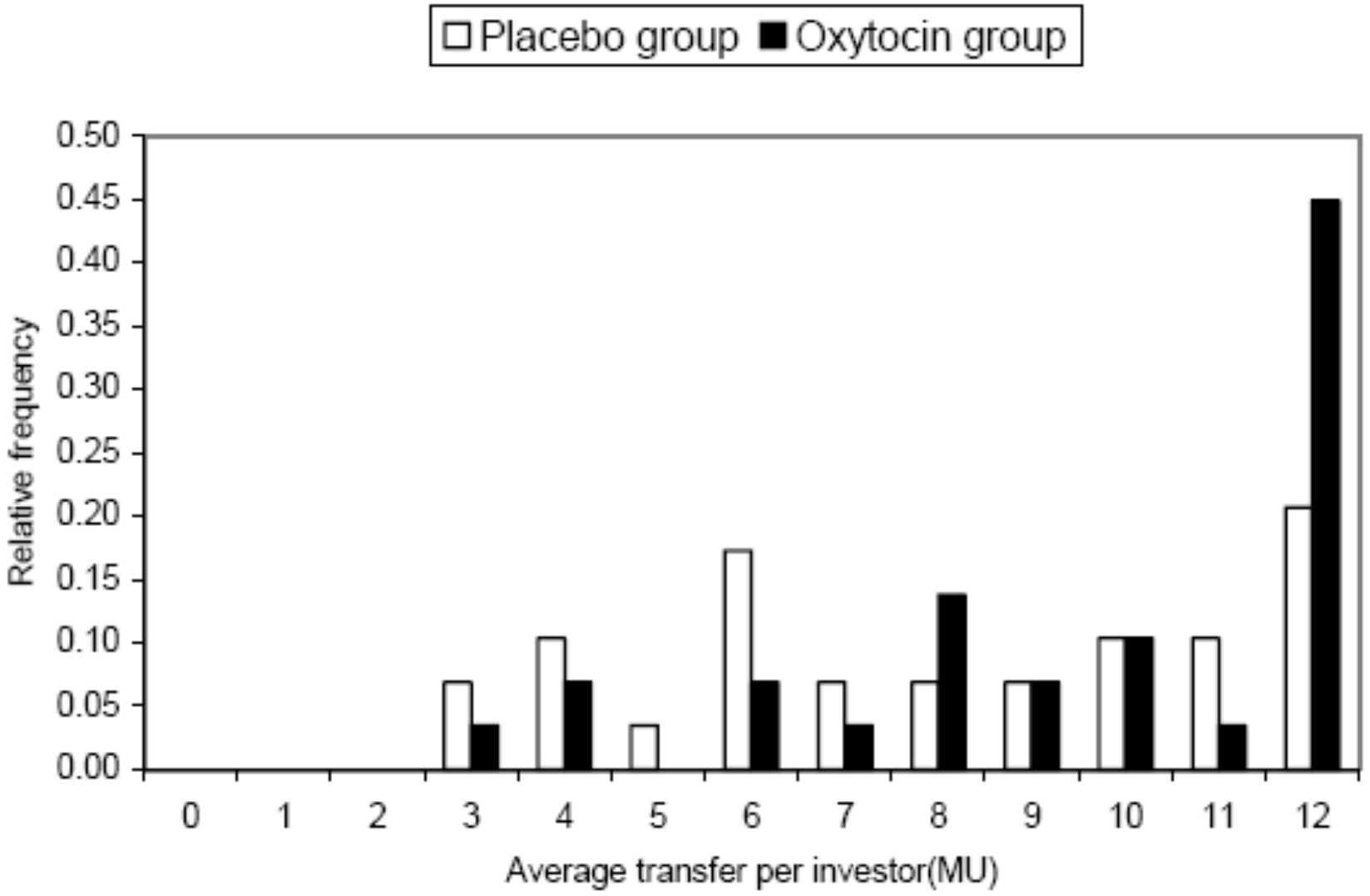


Activation in the prefrontal cortex when subjects know that punishing others will be personally costly to them (compared to control when desire to punish is present but punishment is not costly):

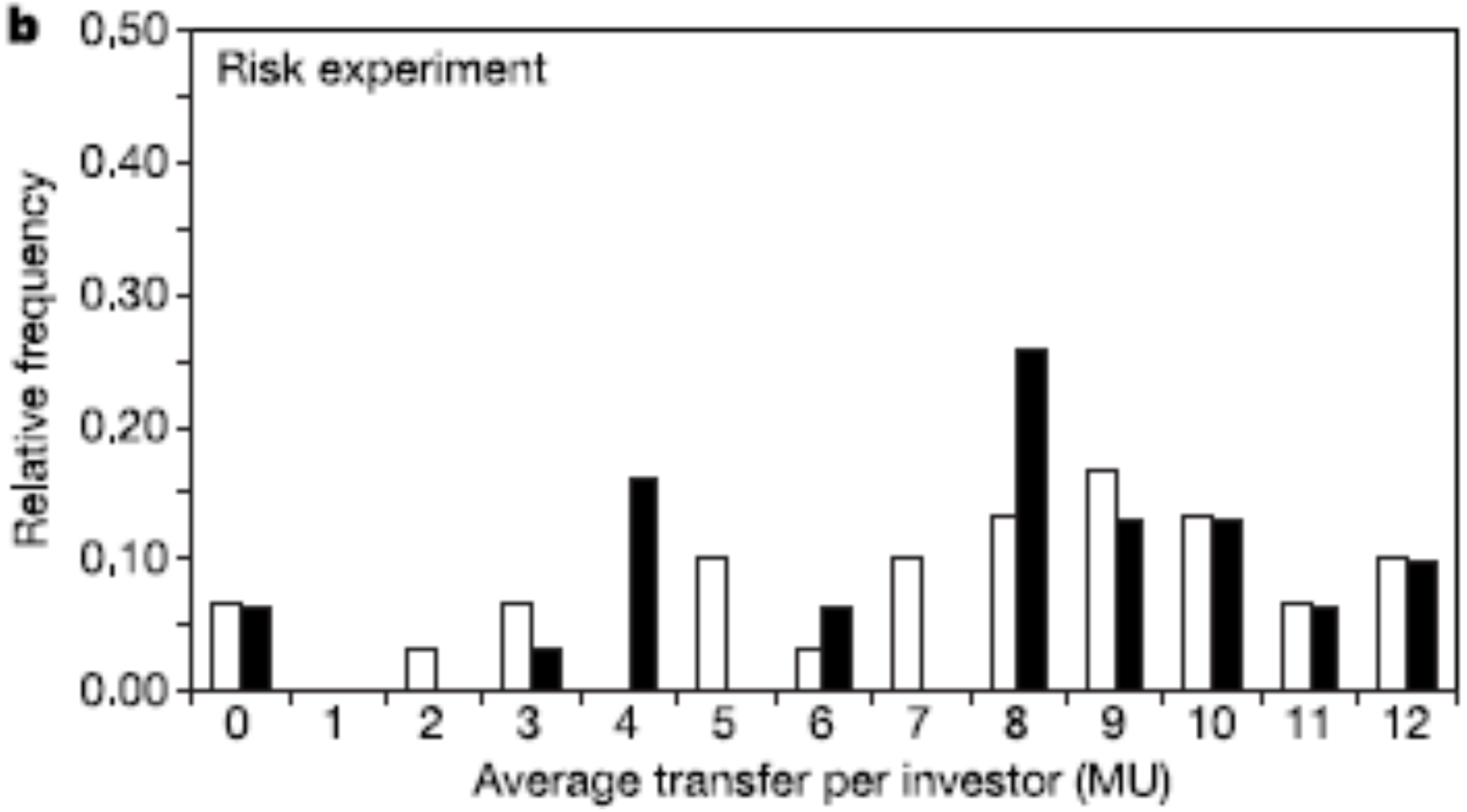


Oxytocin increases trust in humans

(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 about reason and the emotions

- 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?

Other behaviors specific to humans

- As well as depending on social learning, human beings engage in *over-imitation* (studied in particular by Michael Tomasello).
- Children copy as many dimensions of the demonstrators' behavior as they can remember: chimps copy only those whose purpose they can understand. (https://www.youtube.com/watch?v=20Smx_nD9cw)
- In a jungle environment, chimps compete very effectively against children in learning tasks relevant for survival.
- But children can easily beat them when faced with challenges in the laboratory.
- Why would humans have evolved to do this?

Two explanations for the evolution of over-imitation:

- Perhaps the cognitive challenges faced by humans were more difficult, and the solutions less transparent, than those faced by chimps.
- Examples: food extraction from roots, nuts; hunting of large game in time-sensitive environments; warfare (especially ambush).
- In each case, success depends on coordination with others.
- Over-imitation may have other benefits than efficient problem-solving.
- Examples: signaling our commitment to others, our willingness to pay them attention. Evidence that synchrony yields physiological benefits (inc. endorphin release).
- Probably both explanations are partly true. An explanation for ritual?

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