Reciprocal mutualism not altruism: immediate but not delayed time matching in chimpanzee social grooming

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Summary

- Reciprocity is often seen as an underlying mechanism of ongoing dyadic social relationships.
- The default assumption is that both parties are benefiting through a roughly equal investment in each other.
- Biological markets are where partner choice plays a role in maximizing benefits: you choose to interact with a partner likely to reciprocate.
- Allogrooming (social grooming) occurs when one individual cleans the fur and skin of another, which is valuable to the receiver hygienically and hedonically.
- Here, we examined tit-for-tat reciprocation of allogrooming in a group of 25 captive chimpanzees at Chester Zoo UK, focusing on three issues:
  1. Grooming relationships amongst all 325 possible dyads.
  2. Equally of effort within these dyads (i.e. time matching).
  3. Time horizons (time scales whereupon matching may occur)
- Time horizons were of particular interest (because immediate and delayed reciprocity are different):
  - Payback after a delay (such as in reciprocal altruism) entails periods of unseen reward and requires some mechanism (cognitive or otherwise) to bind together both parts of the transaction.
  - In contrast, payback without delay (reciprocal mutualism) requires merely a pay-as-you-receive heuristic.
- Using a generalised mixed-linear method, we found evidence for immediate reciprocation (within-bout grooming) but not for delayed reciprocation.
- Our analysis implies that previous claims of long-term grooming reciprocation amongst chimpanzees are possibly mistaken and that the real mechanisms involving grooming tit-for-tat involve partner choice and immediate reward.

Methods

- Twenty-five captive chimpanzees were observed at Chester Zoo, UK, in 2003-4 by Y. Russell.
- Mean age of the chimpanzees was 18.7 years (SD = 11.2), comprising five adult males, fifteen adult females, four subadult females, and two juveniles.
- We analysed a period of 44.25 hours (over 17 days).
- Among chimpanzees and other primates, an ubiquitous currency of exchange are units of allogrooming (aka social grooming): the units being parcels of time invested when chimpanzee A grooms chimpanzee B (which carries assumptions of cost and benefits).
- Biological markets are where partner choice plays a role in maximizing benefits: you choose to interact with a partner likely to reciprocate.
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Results

- Grooming occurred only in 45% of all possible dyads (146/325).
- Fig. 3 shows how time-matching compares in conditions of immediate (ρ < 0) vs. delayed (ρ ≥ 0) situations. As shown, time-matching more accurate in former.
- Fig. 4 shows the same for each dyad. As shown, there is great variability at the dyad level.
- Fig. 5 shows time-matching compared against a null model. As shown, there is time-matching that occurs in the null model. As shown, when we split the analysis into immediate and delayed time-matching, the time-matching fidelity disappears in the delayed situation.
- We also performed a time-matching regression using a mixed-effects model using the dyad as a random effect in the intercept (not visualised here). We calculated mixed model estimates (standard errors). P-values were calculated using a likelihood ratio test against a null model. As shown, there is no significant effect.

Acknowledgements:

1) Department of Informatics, King’s College London, UK
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