Prosociality as a foundation for intergroup conflict

Dreu, C.K.W. de.; Farina, A.; Gross, J.A.J.; Romano, A.

Available online at www.sciencedirect.com

ScienceDirect

Current Opinion in Psychology

Review

Prosociality as a foundation for intergroup conflict

Carsten K. W. De Dreu[1,2], Andrea Fariña[1], Jörg Gross[1] and Angelo Romano[1]

Abstract

Intergroup conflict can be modeled as a two-level game of strategy in which prosociality can take the form of trust and cooperation within groups or between groups. We review recent work, from our own laboratory and that of others, that shows how biological and sociocultural mechanisms that promote prosocial preferences and beliefs create in-group bounded, parochial cooperation, and, sometimes, parochial competition. We show when and how parochial cooperation and competition intensify rather than mitigate intergroup conflict.

Addresses

[1] Social, Economic and Organizational Psychology, Leiden University, the Netherlands

[2] Center for Experimental Economics and Political Decision Making, University of Amsterdam, the Netherlands

Corresponding author: De Dreu, Carsten K.W (c.k.w.de.dreu@fsw.leidenuniv.nl)

Current Opinion in Psychology 2022, **44**:112–116

This review comes from a themed issue on **Prosociality**

Edited by **Stefan Pfattheicher** and **Isabel Thielmann**

For a complete overview see the Issue and the Editorial

Available online 11 September 2021

https://doi.org/10.1016/j.copsyc.2021.09.002

Keyword

Cooperation, Social preferences, Intergroup relations, Parochialism, Reciprocity, Threat.

Introduction

Humans live in interconnected networks of groups. Within and between groups, humans can be more or less cooperative with each other. Theoretically, cooperation is defined as extending a benefit b to others at a cost c to oneself, with $c < b$. From an evolutionary perspective, a cooperator increases their fitness when cooperation is reciprocated, because the received benefit b exceeds the cost c incurred when initiating cooperation. When others do not cooperate, the individual loses fitness both in absolute and relative terms. This defines the inherent social dilemma of group living — cooperation serves collective welfare and the functioning of the group as a whole; not cooperating or 'free riding' serves personal welfare and individual fitness most [1].

Within and between groups, humans can also compete with others and inflict harm — they deceive and give misleading information, spread negative rumors about others, exclude others from potentially beneficial exchanges, or use verbal or physical aggression. Theoretically, such behaviors impose a cost p on others at a cost c to oneself. Competing reduces overall social welfare but increases relative wealth when $c < p$ and can lead to spite and vengefulness. However, when harm infliction is aimed at free riders, it can also deter free riding and increase cooperation [1–3].

Assuming humans are strictly motivated to maximize personal wealth and expect others to be likewise, group membership should not condition decisions to cooperate and compete — costs and benefits are the same for members of one's own group as they are for members of other groups. And yet, decades of research in the psychological, economic, and biological sciences suggest that humans cooperate more with members of their own rather than other groups (henceforth, parochial cooperation) [4,5]. At least sometimes, humans also compete more with (members of) out-groups rather than their own in-group (henceforth parochial competition) [6,7]. Alone and in combination, parochial cooperation and competition polarize intergroup relations and can trigger cycles of increasingly wasteful intergroup conflict [6].[1]

The question we address here is when and why humans become parochial cooperators and when and why they become parochial competitors. We discuss mechanisms underlying parochialism and review recent evidence. We conclude that intergroup conflict is often an unfortunate outcome of the human preparedness for in-group bounded cooperation.

[1] Parochial cooperation and competition capture what others referred to as weak and strong parochialism, with strong parochialism involving behavior that is more costly to out-groups [36]. In addition, parochial cooperation captures what social identity theory refers to as in-group favoritism and out-group derogation, respectively [8–10]. Although related, however, these earlier conceptualizations tend to conflate preferences and beliefs, on the one hand, and behavioral manifestations on the other. Here, parochial cooperation and competition pertain exclusively to behavioral expressions of benefits extended to and costs imposed on others.

Mechanisms underlying parochial cooperation

Mere membership and social identification

Social identity theory [8—10] proposes that humans heuristically classify themselves and others into distinct social categories on the basis of perceptual, attitudinal, or behavioral similarities [11,12]. Because of a putatively inherent need for self-enhancement [10], people ascribe and emphasize — in thought and behavior — positive features and characteristics to their own category (the 'in-group') and negative features and characteristics to other social categories (the 'out-group').

As stronger (need for) in-group identification associates with stronger in-group favoritism and out-group derogation [8], it may be that mere social categorization suffices for parochial cooperation and competition to emerge [11]. Recent work casts doubt on this possibility. First, experiments show that the effect of group membership is not explained by mere categorization processes or self-enhancement but rather by in-group bounded cooperation that emerges because humans expect reciprocity more from in-group members and because they anticipate future benefits from cooperation more with in-group members [13,14]. Second, meta-analyses [15,16] revealed that parochial cooperation emerges especially when participants are interdependent with in-group or out-group recipients (as in, e.g. trust games and public good provision games; [1] and less so when such interdependence is lacking (as in e.g. dictator games [1]) (also see [14—23]. Finally, recent work suggests that group identification often does not predict the extent of parochial cooperation in social dilemmas [13,17,18]. Identification follows from rather than causally triggers parochial cooperation and competition.

Reputation and (in)direct reciprocity

An alternative mechanism for parochialism is suggested by group bounded reciprocity theory (GBRT) [25]. Drawing on evolutionary game theory, it is assumed that humans need others to survive and prosper. To maintain and secure opportunities for potentially beneficial interactions, humans not only initiate and reciprocate cooperation with others but also adjust their cooperation when their reputation is at stake and prefer and select partners with a known reputation for being reliable, trustworthy, and cooperative. The need to build and maintain a positive reputation and engage in repeated interactions with familiar others creates social groups and group boundaries. Through such sorting mechanisms, people are likely to be less cooperative with unknown others, lone strangers, and members of distant out-groups alike [26—29].

As per GBRT, what matters for parochial cooperation to emerge is an underlying interdependence structure and ability to identify someone's reputation; familiarity cues that serve as the basis for social categorization in social identity theory are, as per GBRT, a consequence of repeated interactions among people. Once established they can serve as heuristic cues to quickly assess whether others belong to in-group cooperators and whether they are able to spread reputation information to potential future interaction partners [6].

Experiments support GBRT. First, meta-analyses revealed stronger parochial cooperation when group members were mutually interdependent and had opportunities for (in)direct reciprocity [15,16]. Second, parochial cooperation is seen more strongly when group members know that their choice (or group membership) is observed by and shared with other ingroup members [30,31]. Third, people are equally likely to withhold cooperation from unknown strangers as from out-group members [4,15].

Attachment and prosociality

Both social identity theory and GBRT imply that parochial cooperation is grounded in the individual's attachment to and reliance on others. If true, we would expect biological and sociocultural mechanisms that promote attachment to and reliance on others to produce parochial cooperation. There is good evidence for this possibility. At the biological level, both (long-term) attachment and (temporary) other concerns are increased with higher levels of oxytocin — a neuropeptide produced in the hypothalamus and functioning as both hormone and neurotransmitter [32]. Participants given intranasal oxytocin (versus matching placebo) are more cooperative with familiar rather than unfamiliar others and display more parochial cooperation [33—35].

At the sociocultural level, decades of research revealed how socialization processes and cultural exposure create persistent individual differences in prosociality [1,36]. As prosocial individuals are more willing to establish and maintain cooperative relations, individuals with stronger prosocial traits are more likely to display parochial cooperation [13], [37—39]. At least sometimes, prosocial people prefer parochial cooperation more than universal cooperation that would benefit in-group and out-group members alike [13,39] (for exceptions [40,41]).

Mechanisms underlying parochial competition

Whereas cooperative reputations and possibilities for (in)direct reciprocity explain parochial cooperation in humans, it remains open whether and why humans (also) engage in parochial competition. And yet they do. People compete more with members of more or less rivaling out-groups than with members of their in-group

[4,5,15,16]. Indirect evidence also comes from experiments in which participants were organized in two three-person groups — an in-group and an out-group. In this Intergroup Prisoner's Dilemma-Maximizing Difference Game [1,6,42], each individual received an endowment from which they could contribute to an in-group pool from which all members of the in-group would benefit. They could also contribute to a 'between-group pool' from which all in-group members would benefit likewise but from which all out-group members would incur a cost. Accordingly, in-group welfare is served equally by contributions to the in-group and the between-group pool, and the only reason for people to invest in the between-group pool is to punish the out-group (*viz.* spite, out-group derogation, or competition). More than 20 independent experiments, performed in the United States, Europe, and the Middle East, have shown time and again that — across cultural contexts — humans contribute to the in-group pool (i.e. parochial cooperation) yet also, albeit to a lesser and more variable degree, to the between-group pool (i.e. parochial competition) [6,39].

Status ranking

One possible reason for parochial competition is that it increases the individual's reputation for being a loyal group member who is willing to self-sacrifice for the protection and prosperity of the in-group. If true, we would expect more parochial competition when intergroup relations are competitive, and the out-group posits a threat to the in-group (also see Section 3.2), and less when intergroup relations are noncompetitive. Experiments support this possibility — individuals reward hawkish behavior toward out-groups [43] and elect individuals who display parochial competition into leadership positions [42].

Indirect support for the idea that within-group reputation and status conditions, parochial competition comes from recent studies showing that individuals with higher levels of the hormone testosterone display enhanced competition for territory and (aggressively) seek and protect status ranking [44]. A recent experiment using the Intergroup Prisoner's Dilemma-Maximizing Difference Game revealed, for example, that endogenous testosterone is associated with more contributions to the within-group pool (*viz.* parochial cooperation) and with more contributions to the between-group pool (*viz.* parochial competition) [45]. In another study, male soccer fans were confronted with (un)fair offers from either a fan of their own team (in-group) or a fan of the rivaling team (out-group). Higher levels of testosterone predicted soccer fans' generosity toward in-group members (*viz.* parochial cooperation) and the rejection of both fair and unfair offers from the antagonistic out-group, revealing a tendency to punish the out-group at a personal cost (*viz.* parochial competition) [46].

Out-group threat

Out-group threat moderates the degree to which people engage in parochial competition. Out-group threat can be defined as the belief that out-groups are willing to invest in parochial competition or have the opportunity to do so. Some studies showed more parochial competition when out-groups could hurt the in-group more rather than less, especially when participants were motivated to protect their in-group [47]. Mifune et al. [48] showed that participants in small groups punished out-groups through pre-emptive strikes out of fear more than because of pure spite toward out-group members. Along similar lines, Ying et al. [49] found that the subjective perception of out-group threat led people to more readily punish out-groups pre-emptively and concluded that out-group punishment was primarily defensive rather than offensive in nature. Finally, a number of studies revealed that out-group threat not only induces parochial competition but also, in parallel, increases parochial cooperation [39], [47–53]. Combined, these experiments suggest that parochial competition is motivated by the desire to protect the in-group, oneself included [6,20,53].

Carrying-capacity stress

Sometimes parochialism manifests in-group members investing personal resources to overrule, subordinate, and exploit other groups. Such out-group attacks hurt out-group members (*viz.* parochial competition) and, when attacks are successful, benefit the in-group with additional 'spoils of war' (*viz.* parochial cooperation). Experiments using Intergroup Attacker-Defender Contests [18], [50–52] have shown repeatedly that individuals invest, at a personal cost, resources in joint group attacks on out-groups. These experiments also revealed such 'cooperation to aggress' tendencies to be particularly prominent when group members went through a ritualistic bonding before the contest [51], when peer punishment could be used to reduce within-group free riding [50] and when within-group attachments were promoted with intranasal administration of oxytocin [52].

Recent experiments showed that 'cooperating to aggress' becomes especially prominent when group members are exposed to environmental risk and resource scarcities — situations in which the group's welfare is exogenously threatened (*viz.* carrying-capacity stress; [6]. In one set of intergroup contest experiments, environmental unpredictability was induced by making noninvested resources subject to risk of destruction (versus not). Environmental unpredictability increased feelings of stress and, at the same time, made out-group aggression more intense and successful. Because unpredictability did not increase in-group defense, aggressing out-groups was often successful when environmental risk was higher. Macrolevel changes that make the natural and

economic environment more threatening to the in-group can be a root cause of parochial competition and, therefore, turn otherwise benign intergroup relations hostile [54].

Conclusions and future research

Biological and sociocultural factors that prepare for prosociality can lead humans to initiate and reciprocate cooperation with familiar others and members of their own in-group. Concerns over in-group cooperation, alongside the need to protect the in-group against outside danger, can lead humans to engage in parochial competition toward neighboring out-groups. Both parochial cooperation and parochial competition are, as such, possible instances of a deeply engrained and probably evolved willingness to serve the group on which humans depend. Both forms of parochialism also, and unfortunately, set out-groups apart from the in-group and trigger group comparisons that can create feelings of deprivation, envy, and injustice.

The research discussed herein relied on settings in which individuals were paired together in groups. There is evidence too that group functioning, in general, and cooperation, in particular, benefit from allowing individuals to freely decide whom to interact with and whom to exclude from future interactions [1,26]. In addition, there is some evidence that individuals prefer to interact with people who, on previous occasions, displayed parochial cooperation and/or competition [42,43]. Future research could examine the hypothesis that during partner selection reputations for parochialism drive the creation of groups that are inherently parochial when cooperating, and, when needed, competing against strangers and members of more or less rivaling out-groups.

Conflict of interest statement

Nothing declared.

Acknowledgements

This project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation program (AdG agreement n° 785635) and the Spinoza Award from the Netherlands Science Foundation (NWO SPI-57-242). C.K.W. De Dreu drafted the article and incorporated coauthor revisions.

References

Papers of particular interest, published within the period of review, have been highlighted as:

* of special interest
** of outstanding interest

1. Van Dijk E, De Dreu CKW: **Experimental games and social decision-making**. *Annu Rev Psychol* 2021, **72**:415–438.

2. De Dreu CKW, Giacomantonio M, Giffin MR, Vechiatto G: **Psychological constraints on aggressive predation in economic contests**. *J Exp Psychol Gen* 2019, **148**:1767–1781.

3. Fehr E, Schurtenberger I: **Normative foundations of human cooperation**. *Nat Hum Behav* 2018, **2**:458–468.

4. Romano A, Balliet D, Yamagishi T, Liu JH: **Parochial trust and cooperation across 17 societies**. *Proc Nat Acad Sci* 2017, **114**:12702–12707.

5. Fiedler S, Hellmann DM, Dorrough AR, Glockner A: **Cross-national in-group favoritism in prosocial behavior. Evidence from Latin and North America**. *Judg Dec Mak* 2018, **13**:42–60.

6. De Dreu CKW, Gross J, Farina A, Ma Y: **Group cooperation, carrying-capacity stress, and intergroup conflict**. *Trends Cognit Sci* 2020, **24**:760–776.

7. Dos Santos M, Knoch D: **Explaining the evolution of parochial punishment in humans**. *Evol Hum Behav* 2020, Advance online publication. https://doi.org/10.1016/j.evolhumbehav.2020.10.002.

8. Hogg MA, Abrams D, Brewer MB: **Social identity: the role of self in group processes and intergroup relations**. *Group Process Intergr Relat* 2017, **20**:570–581.

9. Spears R: **Social influence and group identity**. *Annu Rev Psychol* 2021, **72**:367–390.

10. Tajfel H, Turner J: **The social identity of intergroup behavior**. In *Psychology and Intergroup Relations*. Edited by Worchel S, Chicago: Nelson-Hall; 1979.

11. Dunham Y: **Mere membership**. *Trends Cognit Sci* 2018, **22**:780–793.

12. Liberman Z, Woodward AL, Kinzler KD: **The origins of social categorization**. *Trends Cognit Sci* 2017, **21**:556–568.

13. Aaldering H, Ten Velden FS, Van Kleef GA, De Dreu CKW: **Parochial cooperation in nested intergroup dilemmas is reduced when it harms out-groups**. *J Pers Soc Psychol* 2018, **114**:909–923.

14. ** Misch A, Paulus M, Dunham Y: **Anticipation of future cooperation eliminates minimal ingroup bias in children and adults**. *J Exp Psychol Gen* 2021 (early access).
Based on the assumption that minimal group allocation elicits the anticipation of future within-group cooperation, which in turn elicits in-group preference, we investigate whether changing participants' anticipation from within-group cooperation to between-group cooperation reduces their ingroup bias. In children and adults from the United States and Germany, results show that that changing participants' anticipation of who they will cooperate with from in-group to outgroup members reduced in-group bias in minimal groups but not in non-coalitional groups. Minimal group membership is coded as a marker for future collaboration, and manipulating this expectation can eliminate in-group bias.

15. * Balliet D, Wu Y, De Dreu CKW: **In-group favoritism and cooperation: a meta-analysis**. *Psychol Bull* 2014, **140**:1556–1581.
This paper provides a quantitative analysis of twenty years of research, mainly using experimental games like dictator, trust games and public good provision games on cooperation with partners denoted as in-group versus out-group (versus stranger). The review contrasts predictions derived from social identity theory and bounded reciprocity theory and concludes the evidence favors the latter and is difficult to reconcile with core propositions in social identity theory.

16. Lane T: **Discrimination in the laboratory: a meta-analysis of economics experiments**. *Eur Econ Rev* 2016, **90**:375–402.

17. Romano A, Balliet D, Wu J: **Unbounded indirect reciprocity: is reputation-based cooperation bounded by group membership?** *J Exp Soc Psychol* 2017, **71**:59–67.

18. Rabbie JM, Schot JC, Visser L: **Social identity theory: a conceptual and empirical critique from the perspective of a behavioral interaction-model**. *Eur J Soc Psychol* 1989, **19**:171–202.

19. Böhm R, Fleiss J, Rybnicek R: **On the stability of social preferences in inter-group conflict: a lab-in-the-field panel study**. *J Confl Res* 2021 (early access).

20. De Dreu CKW, Gross J: **Revisiting the form and function of conflict: neurobiological, psychological and cultural mechanisms for attack and defense within and between groups**. *Behav Brain Sci* 2019, **42**:1–44.

21. Froehlich L, Dorrough AR, Glockner A: **Similarity predicts cross-national social preferences**. *Soc Psychol Pers Science* 2021, Advance online publication. https://doi.org/10.1177/1948550620982704.

22. Kolmar M, Wagener A: **Group identities in conflicts**. *Homo Oeconomicus: J Behav Instit Econ* 2019, **36**:165–192.

23. Stanford PK: **The difference between ice cream and Nazis: moral externalization and the evolution of human cooperation**. *Behav Brain Sci* 2018, **41**:e95.

25. * Yamagishi T, Mifune N: **Parochial altruism : does it explain modern human group psychology?** *Curr Opin Psychol* 2016, **7**: 39–43.
The authors provide a critical analysis of parochial altruism as an explanation for cooperation and competition within and between groups and reviews relevant research literatures

26. Gross J, De Dreu CKW: **The rise and fall of cooperation through reputation and group polarization**. *Nat Commun* 2019, **10**:e776.

27. Raub W, Buskens V, Frey V: **Strategic tie formation for long-term exchange relations**. *Rat Soc* 2019, **31**:490–510.

28. * Lau T, Pouncy HT, Gershman SJ, Cikara M: **Discovering social groups via latent structure learning**. *J Exp Psychol Gen* 2018, **147**:1881–1891.
Provides a computational model that specifies how humans learn the social boundaries of groups and coalitions, and provides experimental evidence that humans infer social group structure – who is "in" and "out" – by integrating informations about how agents in the environment relate to one another in addition to oneself.

29. Gallo E, Yan C: **The effects of reputational and social knowledge on cooperation**. *Proc Nat Acad Sci* 2015, **112**:3647–3652.

30. Velez JA: **Extending the theory of Bounded Generalized Reciprocity: an explanation of the social benefits of cooperative video game play**. *Comput Hum Behav* 2015, **48**:481–491.

31. Yamagishi T, Kiyonari T: **The group as the container of generalized reciprocity**. *Soc Psychol Q* 2000, **63**:116–132.

32. Rilling JK, Young LJ: **The biology of mammalian parenting and its effect on offspring social development**. *Science* 2014, **345**: 771–776.

33. * McClung JS, Triki Z, Clément F, Bangerter A, Bsary R: **Endogenous oxytocin predicts helping and conversation as a function of group membership**. *Proc Roy Soc Biol* 2018, **285**: 20180939.
An experiment using a novel egg-hunting game shows that humans more likely help in-group rather than out-group members, and that such in-group bias is mediated by the release of endogenous oxytocin present in saliva

34. Ten Velden FS, Daughters K, De Dreu CKW: **Oxytocin promotes intuitive rather than deliberated cooperation with the in-group**. *Horm Behav* 2017, **92**:164–171.

35. De Dreu CKW, Kret ME: **Oxytocin conditions intergroup relations through up-regulated in-group empathy, cooperation, conformity, and defense**. *Biol Psychiatr* 2016, **79**:165–173.

36. Aaldering H, Böhm R: **Parochial versus universal cooperation: introducing a novel economic game of within- and between-group interaction**. *Soc Psychol Pers Sci* 2020, **11**:36–45.

37. Rahal RM, Fiedler S, De Dreu CKW: **Prosocial preferences condition decision effort and ingroup biased generosity in intergroup decision-making**. *Nature Sci Rep* 2020, **10**:10132.

38. ** Weisel O, Zultan R: **Perceptions of conflict: parochial cooperation and outgroup spite revisited**. *Org Behav Hum Dec Process* 2021 (in press).
A controlled laboratory experiment manipulated perception of the conflict level by varying the framing of the conflict, keeping the objective strategic aspects of conflict fixed. While parochial cooperation appeared as the main motivation under an individual frame (replicating prior results), outgroup spite emerges as an important motivation when conflict is perceived at the group level. Furthermore, intragroup communication and pro-sociality are related to parochial cooperation under an individual frame, and equally related to parochial cooperation and outgroup spite under a group frame.

39. Israel S, Weisel O, Ebstein RP, Bornstein G: **Oxytocin, but not vasopressin, increases both parochial and universal altruism**. *Psychoneuroendocrinology* 2012, **37**:1341–1344.

40. Thielmann I, Böhm R: **Who does (not) participate in intergroup conflict?** *Soc Psychol Pers Science* 2016, **7**:778–787.

41. Aaldering H, Bohm R: **Parochial versus universal cooperation: introducing a novel economic game of within- and between-group interaction**. *Soc Psychol Pers Sci* 2020, **11**:36–45.

42. Halevy N, Chou EY, Cohen TR, Livingston RW: **Status conferral in intergroup social dilemmas: behavioral antecedents and consequences of prestige and dominance**. *J Pers Soc Psychol* 2012, **102**:351–366.

43. Rusch H: **Asymmetries in altruistic behavior during violent intergroup conflict**. *Evol Psychol* 2013, **11**:973–993.

44. Geniole SN, Carré JM: **Human social neuroendocrinology: review of the rapid effects of testosterone**. *Horm Behav* 2018, **104**:192–205.

45. Schweda A, Faber NS, Crockett MJ, Kalenscher T: **The effects of psychosocial stress on intergroup resource allocation**. *Sci Rep* 2019, **9**:18620.

46. Reimers L, Buchel C, Diekhof EK: **Neural substrates of male parochial altruism are modulated by testosterone and behavioral strategy**. *Neuroimage* 2019, **156**:265–276.

47. Böhm R, Rusch H, Güreck O: **What makes people go to war? Defensive intentions motivate retaliatory and preemptive intergroup aggression**. *Evol Hum Behav* 2016, **37**:29–34.

48. Mifune N, Simunovic D, Yamagishi T: **Intergroup biases in fear-induced aggression**. *Front Psychol* 2017, **8**:e49.

49. Jing YM, Gries PH, Li Y, Stivers AW, Mifune N, Kuhlman DM, Bai LY: **War of Peace? How the subjective perception of great power interdependence shapes preemptive defensive aggression**. *Front Psychol* 2017, **8**:exx.

50. De Dreu CKW, Gross JAJ, Meder Z, Griffin MR, Prochazkova E, Krikeb J, Columbus S: **In-group defense, out-group aggression, and coordination failure in intergroup conflict**. *Proc Nat Acad Sci* 2016, **113**:10524–10529.

51. ** Yang J, Zhang H, Ni J, De Dreu CKW, Ma Y: **Within-group synchronization in the prefrontal cortex associates with intergroup conflict**. *Nat Neurosci* 2020, **23**:754–760.
Taking a neuroeconomics approach to intergroup conflict, this study identified within-group neural synchronization in the prefrontal cortex (rDLPFC and rTPJ) as a candidate mechanism underlying intergroup hostility. In three-versus-three-person intergroup competitions that were subjected to a short in-group bonding exercise or not, neural activity and within-group synchronization using functional near-infrared spectroscopy was measured while group members invested in the conflict. After in-group bonding, individuals showed more parochial cooperation and out-group spite, and especially during out-group attack, increased within-group synchronization in the prefrontal cortex. The authors conclude that within-group synchronized reduction in prefrontal activity might explain how in-group bonding leads to impulsive and collective hostility toward outsiders.

52. Zhang H, Gross J, De Dreu CKW, Ma Y: **Oxytocin promotes coordinated out-group attack during intergroup conflict in humans**. *eLife* 2019, **8**, e40698.

53. ** Doğan G, Glowacki L, Rusch H: **Spoils division rules shape aggression between natural groups**. *Nat Hum Behav* 2018, **2**: 322–326.
Distinguishing offensive and defensive intergroup aggression, this article asks whether an asymmetric division of a conflict's spoils may motivate those profiting from such inequality to initiate between-group aggression, even if doing so jeopardizes their group's welfare. In a contest experiment among three Ethiopian societies whose relations are either peaceful or violent, between-group hostility increased contest contributions under equal sharing. By contrast, unequal sharing prompted offensive contribution strategies in privileged participants, whereas disadvantaged participants resorted to defensive strategies, both irrespective of group relations.

54. De Dreu CKW, Gross J, Reddmann LR: *Environmental Stress Can Motivate Out-Group Aggression and Intergroup Conflict.* 2022. Working Paper, Leiden University.