Available online at www.sciencedirect.com

ScienceDirect

Current Opinion in Psychology

Power in economic games

Eric van Dijk[1], Carsten KW De Dreu[1,2] and Jörg Gross[1]

Economic games offer an analytic tool to examine strategic decision-making in social interactions. Here we identify four sources of power that can be captured and studied with economic games – asymmetric dependence, the possibility to reduce dependence, the ability to punish and reward, and the use of knowledge and information. We review recent studies examining these distinct forms of power, highlight that the use of economic games can benefit our understanding of the behavioral and neurobiological underpinnings of power, and illustrate how power differences within and between groups impact cooperation, exploitation, and conflict.

Addresses
[1] Leiden University, Netherlands
[2] University of Amsterdam, Netherlands

Corresponding author: van Dijk, Eric (dijk@fsw.leidenuniv.nl)

Current Opinion in Psychology 2020, **33**:100–104

This review comes from a themed issue on **Power, status, and hierarchy**

Edited by **Gerben van Kleef** and **Joey Cheng**

https://doi.org/10.1016/j.copsyc.2019.07.019

Introduction

In economics, power is often viewed as the decision-maker's ability to pursue his or her preferred outcome in a social interaction. This perspective connects power to (inter)dependence [1], and the notion that the power of actor A over B is a function of the degree to which B depends on A for valuable resources [2]. An important step to understand and analyze the influence of power on social relations has been made with the advent of game theory [3]. Game theory offers a mathematically rigorous approach to strategic behavior and depicts interdependence as a set of strategies that agents (individuals, or groups) can follow in a format that explicates the outcomes for all parties. In the well-known Prisoner's Dilemma (PD), for example, each agent decides between two actions, cooperation and defection, and the action-pair determines the outcome of both agents, thus rendering them interdependent. Furthermore, in the PD, it is in each agent's best interest that the other agent acts against their own best interest (choosing cooperation rather than defection). To persuade or force others to act against their own best interest requires power, and herein may lie the motivation for people to seek power, maintain and protect their power, and use their power to their advantage.

Sources of power in economic games

Psychology has identified different sources of power, including coercive power, reward or punishment power, and expert and informational power [4]. Economic games offer a tractable and unified framework for operationalizing sources of power as a result of asymmetric availability of information, strategies, or outcomes across agents that together determine the social game they are 'playing'. For example, agents can be considered more powerful when their own actions and strategies determine the outcome of a social interaction more than those of the other agents (*asymmetric dependence*). Relatedly, power can be a result of outside options that enable agents to solve a situation independent of others, and simply leave a social interaction (*power to reduce dependence*, and related to Best Alternative to Negotiated Agreement; BATNA [5]). Power can also stem from the ability of an agent to decrease (punish) or increase (reward) the outcomes of others (*punishment or reward power*). And lastly, power results from agents having more knowledge about the action space, outcomes, and state of the game, allowing them to strategically use this knowledge, for example, to persuade others to act against their own interest (*information power*).

Asymmetric dependence

Asymmetric dependence in economic games is modeled by assuming that the actions of one agent have more impact on the result of a social interaction than the actions of the other. In the most extreme case, one agent has full control over the outcome, while the other is powerless. This is the case in the so-called Dictator Game (DG) [6]. In the DG one agent (the 'dictator') makes an offer to allocate a resource (e.g. $10 or one hour of work) between herself and a receiver. The receiver has no choice other than to accept. In a variation of this game, the Ultimatum Game (UG), the recipient gets the possibility to reject the offer with the consequence of both players ending up with zero outcomes (e.g. $0 or one hour of work for each of them) [7]. Recipients are usually being offered less in the DG than in the UG [8], showing that power asymmetries matter for social choice.

Interestingly, and in violation of standard economic theory, even dictators in the DG often offer a considerable share of the resource. Even when people have 'absolute power' they are willing to take another's interests into account when making decisions. Research on Delta Games, in which

upon rejection the outcomes for both players are multiplied by δ ($0 \leq \delta \leq 1$), even suggests there is a bonus to having no power as compared to low power. Recipients who are absolutely powerless ($\delta = 1$; comparable to the Dictator Game) are offered more than when they have only a limited amount of power (e.g. $\delta = 0.9$), a finding that can be explained by the evoked responsibility individuals feel for those who fully depend on them [9].

Power to reduce dependence

Recent work has started to allow players to choose new interaction partners, invest resources to avoid being dependent on others, or even leave the game entirely. Partner choice creates strong selection pressures on behavior [10]. In social dilemma games, like the PD, it allows cooperators to leave defectors and search for like-minded cooperators, which in turn motivates defectors to start cooperating [11,12]. This can promote the building of cooperative social networks that possibly already characterized human societies at an early point in history [13]. Yet in other environments, like a cheating game, it allows liars to better find likeminded liars, exerting pressure on the sustainability of honesty in groups [14,15•]. Exiting, and leaving the game entirely may threaten collective welfare [16]. A recent study showed that people are willing to pay a premium to free them from the dependence on other's actions [17]. This research shows that paying for independence allows agents to avoid the free-rider problem that often comes with social interactions. Yet, the ability to pursue individual solutions for shared problems can have adverse effects on cooperation and social welfare. In such situations, cooperation may be sustained by taking away the power to choose.

Punishment and reward power

Research on punishment power has mainly focused on social dilemma games like the Public Good Game (PG), an *N*-person extension of the 2-person PD. It shows that people often use their punishment power to indirectly 'force' those into cooperation who initially refuse to cooperate with the group, even at a cost to themselves (i.e. costly punishment) [18]. People do so even when they themselves are not directly affected by the outcome of a social interaction (third party punishment [19]). Costly punishment can be motivated by a concern to correct the other's behavior, and deter norm violations and free-riding on future occasions [20,21]. Experiments suggest that costly punishment can also be driven by emotions, including anger and spite. For example, when an action is perceived as unfair, people may reject or punish the action (willing to forego a positive reward themselves or spend own additional resources) out of anger [22,23].

Whereas giving agents punishment power may thus be helpful in preventing free-riding and the breakdown of cooperation, it can also backfire. When punishment power is equally divided across agents in PG games it invites retaliation, cycles of revenge [24], or leads to negative reputation [25••]. One way to circumvent this is the delegation of decision power to an authority via an explicit election procedure [26]. Further, individuals are willing to transfer power to fellow group members and, because of this, groups create endogenously emerging hierarchical power structures that better sustain cooperation [27]. Such a delegation may also take the form of pooled punishment systems in which – before being informed of others' contribution decisions – individuals contribute resources to centralized systems that are designed to implement punishment to those who will not cooperate [28]. Relatedly, research suggests that individual group members are willing to forgo own punishment power to install a 'gun for hire', that is, to delegate punishment power to a third party or a punishment mechanism that is granted the authority to punish the low(est) contributors [29]. Even without explicit pooling or delegation, however, tacit coordination may single out specific group members to do the punishment. For example, if the costs of punishment differ, those group members with the lowest costs to punish may be the ones to exert their punishment power the most [30,31].

Anticipation of the negative consequences of exerting one's punishment power may lead power holders to employ alternative ways, such as using reward to encourage desirable actions rather than using punishment to deter unwanted actions. A reluctance to be responsible for harming others [32] or fear of obtaining a negative reputation [25••] may favor the use of rewards rather than punishments, and using rewards may be as effective as punishments [33]. However, the use of reward power and its underlying motives are not as well understood as the use of punishment power. Moreover, when and how people decide to use punishments and/or rewards to influence the social interaction is unclear. Research on third-party punishment and compensation games, in which observers have the power to punish the offender and/or to compensate the victim, has shown that observers sometimes rather compensate than punish; a decision that has been related to empathic concerns [34]. Other studies, using a neuro-computational approach, demonstrated that participants were willing to incur costs to both punish and compensate in response to unfairness, but also that participants were more likely to punish than to compensate and were willing to spend more on punishment when they themselves were victims than when someone else was hurt [35•].

Information power: private information and deception

The consequences of information asymmetry are nicely illustrated by George Akerlof's [36] example of lemon markets: Knowing the true value of a car, used car dealers have an incentive to overstate its quality. Since buyers are

less able to check the state of the car before buying, they can be tricked into paying more than they would, had they known the car's true value. Information asymmetries and resulting power asymmetries lie at the heart of the Principal-Agent (P-A) problem [37,38], where the outcome of a 'principal' depends on the effort (or decisions) of an 'agent', while the agent's outcome depends on the principal's decision to compensate the agent contingent on her effort. P-A games model the relation between managers and their employees, between elected officials and citizens, or a client and a lawyer.

Asymmetric information and incomplete monitoring result in power asymmetries and a dilemma for the principals who have to determine how to treat the agents without being able to verify whether agents truly invested the effort. Possible solutions include contracts (e.g. buy-back insurances for used cars) and power control mechanisms that principals can use to restrict their agent's option space (e.g. setting a minimum presence requirement for employees). Research shows that principals are often reluctant to restrict the behavioral options and that doing so can have hidden costs. Apart from the fact that agents may rebel against such restriction of their freedom of choice [39], it may lead to distrust among agents and a crowding out effect of intrinsic pro-social attitudes that reduce subsequent effort [40].

Some studies provided the principal with an information advantage such that the agent only knows his/her own outcomes without being able to see the earnings of the principal. In such settings, principals are more likely to exploit the agent by misrepresenting information to guide the agent to act in service of the principal [41]. Similar findings emerged from studies using the UG with information advantages to one of the parties involved. For example, proposers were given more information about the true value of the resource than receivers, and were allowed to (honestly or dishonestly) communicate the value of the resource when making their offer. Results show that proposers are often willing to exploit this information advantage and misinform rather than truly inform their receiver [42]. Such abuse of information power reduces with increased chances of deceit detection due to monitoring [43••]. While this suggests that bargainers may only refrain from deception when fearing their deception might be revealed with adverse consequences, other research showed that bargainers also refrain from deception if the recipient is low in power. In this case, using one's information power is not necessary since the asymmetric dependence allows one to increase the own outcomes even without deception [44].

Similar issues have been studied in Sender–Receiver Games, also known as Deception games [45]. In these games, Receivers can choose between two or more options that vary in the extent to which they are beneficial to the Receiver or the Sender. The Receiver, however, is unaware of the differential outcomes of the options and for this purpose has to rely on the Sender, who does know about the distributions for all options. The information advantage gives the Sender the power to misinform the Receiver. Here too, the power to mislead is often exerted and Senders misinform to benefit themselves at the expense of the Receiver (although some also lie to benefit the receiver) [46].

Conclusions

Economic games offer an elegant operationalization of the various sources of power identified in psychology, including asymmetry in dependency, the power to reduce dependency, punishment and reward power, and information power. The economic game approach to power can be easily be used and extended to three distinct areas of inquiry. First, because of its simplicity and focus on decision making, economic games are useful in combination with neuroscientific methods (like functional magnetic resonance imaging) to elucidate the neurobiological underpinnings of (different types of) power on decisions making and strategic choice. Indeed, recent work using economic games identified neuronal structures and hormonal modulation underlying power-related changes in fairness, trust, or aversion to social responsibility [47,48•,49•,50,51]. Second, power has been studied extensively in games between individual agents or within groups of agents. Power differences also emerge and exist in multi-level interactions where individuals are nested in groups that are, in turn, nested in intergroup systems [52,53]. Economic games can be used to test how power differences within and between groups alone and in combination influence individual and group-level decision-making, allowing to study the escalation or de-escalation of intergroup competition, exploitation, and conflict. Third, the specified outcomes structure of economic games can facilitate the study of cross-country and cross-cultural differences [54,55], and thereby help to expand the knowledge of how power affects (economic) behaviors in different societies.

Conflict of interest statement

Nothing declared.

References and recommended reading

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

- • of special interest
- •• of outstanding interest

1. Thibaut JW, Kelley HH: *The Social Psychology of Groups*. John Wiley & Sons; 1959.

2. Emerson R: **Social exchange theory**. *Ann Rev Sociol* 1976, **2**:335-362.

3. Von Neumann J, Morgenstern O: *Theory of Games and Economic Behavior*. Princeton University Press; 1944.

4. Raven BH: **Social influence and power**. In *Current Studies in Social Psychology*. Edited by Steiner ID, Holt Fishbein Msbi . Rinehart, Winston; 1965:371-382.

5. De Dreu CKW: **Social conflict: the emergence and consequences of struggle and negotiation**. In *Handbook of Social Psychology*. Edited by Fiske ST, Gilbert DT, Lindzey H. Wiley; 2010:983-1023.

6. Engel C: **Dictator games: a meta study**. *Exp Econ* 2011, **14**:583-610 http://dx.doi.org/10.1007/s10683-011-9283-7.

7. Güth W, Schmittberger R, Schwarze B: **An experimental analysis of ultimatum games**. *J Econ Behav Organ* 1982, **3**:367-388 http://dx.doi.org/10.1016/0167-2681(82)90011-7.

8. Bechler C, Green L, Myerson J: **Proportion offered in the dictator and ultimatum games decreases with amount and social distance**. *Behav Process* 2015, **115**:149-155 http://dx.doi.org/10.1016/j.beproc.2015.04.003.

9. Handgraaf MJJ, Van Dijk E, Vermunt RC, Wilke HAM, De Dreu CKW: **Less power or powerless? Egocentric empathy gaps and the irony of having little versus no power in social decision making**. *J Pers Soc Psychol* 2008, **95**:1136-1149 http://dx.doi.org/10.1037/0022-3514.95.5.1136.

10. Barclay P: **Biological markets and the effects of partner choice on cooperation and friendship**. *Curr Opin Psychol* 2016, **7**:33-38 http://dx.doi.org/10.1016/j.copsyc.2015.07.012.

11. Efferson C, Roca CP, Vogt S, Helbing D: **Sustained cooperation by running away from bad behavior**. *Evol Hum Behav* 2016, **37**:1-9 http://dx.doi.org/10.1016/j.evolhumbehav.2015.05.003.

12. Rand DG, Arbesman S, Christakis NA: **Dynamic social networks promote cooperation in experiments with humans**. *Proc Natl Acad Sci U S A* 2011, **108**:19193-19198 http://dx.doi.org/10.1073/pnas.1108243108.

13. Apicella CL, Marlowe FW, Fowler JH, Christakis NA: **Social networks and cooperation in hunter-gatherers**. *Nature* 2012, **481**:497-501 http://dx.doi.org/10.1038/nature10736.

14. Abbink K: **Staff rotation as an anti-corruption policy: an experimental study**. *Eur J Polit Econ* 2004, **20**:887-906 http://dx.doi.org/10.1016/j.ejpoleco.2003.10.008.

15. • Gross J, Leib M, Offerman T, Shalvi S: **Ethical free-riding: when honest people find dishonest partners**. *Psychol Sci* 2018, **29**:1956-1968 http://dx.doi.org/10.1177/0956797618796480.
Participants in pairs had to report die rolls. Pairs earned additional money if they reported to have thrown' doubles', creating an incentive to coordinately lie. In one condition, participants were given the freedom to switch interaction partners. Both honest and dishonest participants took advantage of partner selection, seeking partners that willingly misreported their die roll outcomes, allowing them to maximize their earnings.

16. Haesevoets T, Bostyn DH, Reinders Folmer C, Roets A: **Decision-making in the prisoner's dilemma game: the effect of exit on cooperation and social welfare**. *J Behav Decis Making* 2019, **32**:61-78 http://dx.doi.org/10.1002/bdm.2096.

17. Gross J, De Dreu CKW: **Individual solutions to shared problems create a modern tragedy of the commons**. *Sci Adv* 2019, **5** http://dx.doi.org/10.1126/sciadv.aau7296 eaau7296.

18. Fehr E, Gächter S: **Cooperation and punishment in public goods experiments**. *Am Econ Rev* 2000, **90**:980-994 http://dx.doi.org/10.1257/aer.90.4.980.

19. Fehr E, Fischbacher U: **Third-party punishment and social norms**. *Evol Hum Behav* 2004, **25**:63-87 http://dx.doi.org/10.1016/S1090-5138(04)00005-4.

20. Kurzban R, DeScioli P: **Adaptionist punishment in humans**. *J Bioecon* 2013, **15**:269-279 http://dx.doi.org/10.1007/s10818-013-9153-9.

21. Tan F, Xiao E: **Third-party punishment: retribution or deterrence?** *J Econ Psychol* 2018, **67**:34-46 http://dx.doi.org/10.1016/j.joep.2018.03.003.

22. Galeotti F: **Do negative emotions explain punishment in power-to-take game experiments?** *J Econ Psychol* 2015, **49**:1-14 http://dx.doi.org/10.1016/j.joep.2015.03.005.

23. Gummerum M, Van Dillen LF, Van Dijk E, López-Pérez B: **Costly third-party interventions: the role of incidental anger and attention focus in punishment of the perpetrator and compensation of the victim**. *J Exp Soc Psychol* 2016, **65**:94-104 http://dx.doi.org/10.1016/j.jesp.2016.04.004.

24. Nikiforakis N, Noussair C, Wilkening T: **Normative conflict and feuds: the limits of self-enforcement**. *J Public Econ* 2012, **96**:797-807 http://dx.doi.org/10.1016/j.jpubeco.2012.05.014.

25. •• De Kwaadsteniet EW, Kiyonari T, Molenmaker WE, Van Dijk E: **Do people prefer leaders who sanction? Reputational effects of reward and punishment decisions in noisy social dilemmas**. *J Exp Soc Psychol* 2019 http://dx.doi.org/10.1016/j.jesp.2019.03.011. [In press].
Three social dilemma experiments that manipulated behavioral noise, and measured the reputations leaders may get by using reward versus punishment power, reveal the reputational risks of using power. Especially under behavioral noise– when the underlying motives for cooperation and noncooperation are unclear – the exertion of punishment power may yield one a negative reputation.

26. Chiang Y, Hsu Y: **Direct election of group decision-makers can facilitate cooperation in a public goods game**. *Group Decis Negot* 2017, **26**:197-213 http://dx.doi.org/10.1007/s10726-016-9478-6.

27. Gross J, Méder ZZ, Okamoto-Barth S, Riedl A: **Building the Leviathan-voluntary centralization of punishment power sustains cooperation in humans**. *Sci Rep* 2016, **6**:20767 http://dx.doi.org/10.1038/srep20767.

28. Traulsen A, Röhl T, Milinkski M: **An economic experiment reveals that humans prefer pool punishment to maintain the commons**. *Proc R Soc B* 2012, **279**:3716-3721 http://dx.doi.org/10.1098/rspb.2012.0937.

29. Andreoni J, Gee LK: **Gun for hire: delegated enforcement of peer punishment in public goods provision**. *J Public Econ* 2012, **96**:1036-1046 http://dx.doi.org/10.1016/j.jpubeco.2012.08.003.

30. Diekmann A, Przepiorka W: **Punitive preferences, monetary incentives and tacit coordination in the punishment of defectors promote cooperation in humans**. *Sci Rep* 2015, **5**:10321 http://dx.doi.org/10.1038/srep10321.

31. Przepriorka W, Diekmann A: **Individual heterogeneity and costly punishment: a volunteer's dilemma**. *Proc R Soc B* 2013, **280** http://dx.doi.org/10.1098/rspb.2013.0247 20130247.

32. Molenmaker WE, De Kwaadsteniet EW, Van Dijk E: **The impact of personal responsibility on the (un)willingness to punish non-cooperation an reward cooperation**. *Organ Behav Hum Decis Process* 2016, **134**:1-15 http://dx.doi.org/10.1016/j.obhdp.2016.02.004.

33. Balliet D, Mulder LB, Van Lange PAM: **Reward, punishment, and cooperation: a meta-analysis**. *Psychol Bull* 2011, **137**:594-615 http://dx.doi.org/10.1037/a0023489.

34. Leliveld MC, Van Dijk E, Van Beest I: **Punishing and compensating others at your own expense: the role of empathic concern on reactions to distributive injustice**. *Eur J Soc Psychol* 2012, **42**:135-140 http://dx.doi.org/10.1002/ejsp.872.

35. • Stallen M, Rossi F, Heijne A, Smidts A, De Dreu CKW, Sanfey A: **Neurobiological mechanisms of responding to injustice**. *J Neurosci* 2018, **38**:2944-2954 http://dx.doi.org/10.1523/jneurosci.1242-17.2018.
This experiment showed that second-party and third-party punishment track different neurocomputational processes in the human brain—the anterior insula was related to decisions to punish after being harmed; in third-party settings, punishment severity was associated with amygdala activation, while the frequency of punishments was higher when subjects self-administered oxytocin rather than placebo.

36. Akerlof GA: **The market for 'lemons': quality uncertainty and the market mechanism**. *Q J Econ* 1970, **84**:488-500 http://dx.doi.org/10.2307/1879431.

37. Jensen MC, Meckling WH: **Theory of the firm: managerial behavior, agency costs and ownership structure**. *J Financ Econ* 1976, **3**:305-360 http://dx.doi.org/10.1016/0304-405X(76)90026-X.

38. Whitford AB, Bottom WP, Miller GJ: **The (negligible) benefit of moving first: efficiency and equity in principal-agent**

negotiations. *Group Decis Negot* 2013, **22**:499-518 http://dx.doi.org/10.1007/s10726-011-9280-4.

39. Rudorf S, Baumgartner T, Knoch D: **Peer effects on control-averse behavior**. *Sci Rep* 2019, **9**:3012 http://dx.doi.org/10.1038/s41598-019-39600-9.

40. Falk A, Kosfeld M: **The hidden costs of control**. *Am Econ Rev* 2006, **96**:1611-1630 http://dx.doi.org/10.1257/aer.96.5.1611.

41. Nikiforakis N, Oechssler J, Shah A: **Hierarchy, coercion, and exploitation: an experimental analysis**. *J Econ Behav Organ* 2014, **97**:155-168 http://dx.doi.org/10.1016/j.jebo.2013.06.008.

42. Besancenot D, Dubart D, Vranceanu R: **The value of lies in an ultimatum game with imperfect information**. *J Econ Behav Organ* 2013, **93**:239-247 http://dx.doi.org/10.1016/j.jebo.2013.03.029.

43. •• Chavanne D, Ferreira M: **When knowledge is not power: asymmetric information, probabilistic deceit detection and threats in ultimatum bargaining**. *J Behav Exp Econ* 2017, **69**:4-17 http://dx.doi.org/10.1016/j.socec.2017.05.004.
In a study on ultimatum bargaining, allocators were provided with information power to misinform the recipient by understating the true size of the resources. The authors also manipulated the chances for deception to be revealed, and the recipient's possibility to threaten the allocator. The combination of threats and deceit detection was most effective in deterring allocators from using deception.

44. Koning L, Steinel W, Van Beest I, Van Dijk E: **Power and deception in ultimatum bargaining**. *Organ Behav Hum Decis Process* 2011, **115**:35-42 http://dx.doi.org/10.1016/j.obhdp.2011.01.007.

45. Gneezy U: **Deception: the role of consequences**. *Am Econ Rev* 2005, **95**:384-394 http://dx.doi.org/10.1257/0002828053828662.

46. Capraro V: **Gender differences in lying in sender-receiver games: a meta- analysis**. *Judgm Decis Making* 2018, **13**:345-355.

47. Engelmann JB, Meyer F, Ruff CC, Fehr E: **The neural circuitry of affect-induced distortions of trust**. *Sci Adv* 2019, **5** http://dx.doi.org/10.1126/sciadv.aau3413 eaau341343.

48. • Van Baar JM, Chang LJ, Sanfey AG: **The computational and neural substrates of moral strategies in social decision-making**. *Nat Commun* 2019, **10**:e1483 http://dx.doi.org/10.1038/s41467-019-09161-6.
Using the trust game, Van Baar *et al*. manipulated the knowledge about the rules of the game across actors. The trustor believed that every unit transferred to the trustee is multiplied by four, while, in fact, the units were either multiplied by two, four, or six across trials. The trustee not only knew about the actual multiplier, but also about the ignorance of the trustor. With a multiplier of six, some trustees exploited this information asymmetry by transferring only ~1/3 of the transferred units back to the trustor, allowing them to be perceived as trustworthy in the eyes of the trustor, while keeping most of the units for themselves.

49. • Edelson MG, Polania R, Ruff CC, Fehr E, Hare TA: **Computational and neurobiological foundations of leadership decisions**. *Science* 2018, **361** http://dx.doi.org/10.1126/science.aat0036 eaat0036.
Leadership and the power come with responsibilities for others' outcomes. Collecting behavioral decisions and fMRI data of 40 participants in a task that allowed individuals to delegate decision-power, the study investigated the neural mechanisms of responsibility aversion. The findings suggest that individuals with low responsibility aversion are more likely to self-select to strive for high-power positions.

50. Strang S, Gross J, Schuhmann T, Riedl A, Weber B, Sack AT: **Be nice if you have to: the neurobiological roots of strategic fairness**. *Soc Cogn Affect Neurosci* 2015, **10**:790-796 http://dx.doi.org/10.1093/scan/nsu114.

51. Mehta PH, Mor S, Yap AJ, Prasad S: **Dual-hormone changes are related to bargaining performance**. *Psychol Sci* 2015, **26**:866-876 http://dx.doi.org/10.1177/0956797615572905.

52. De Dreu CKW, Gross J, Méder Z, Griffin MR, Prochazkova E, Krikeb J, Columbus S: **In-group defense, out-group aggression, and coordination failure in intergroup conflict**. *Proc Natl Ac Sci U S A* 2016, **113**:10524-10529 http://dx.doi.org/10.1073/pnas.1605115113.

53. Gross J, De Dreu CKW: **The rise and fall of cooperation through reputation and group polarization**. *Nat Commun* 2019, **10**:1-10 http://dx.doi.org/10.1038/s41467-019-08727-8.

54. Oosterbeek H, Sloof R, Van de Kuilen G: **Cultural differences in ultimatum game experiments; evidence from a meta-analysis**. *Exp Econ* 2004, **7**:171-188 http://dx.doi.org/10.1023/B:EXEC.0000026978.14316.74.

55. Henrich J, Boyd R, Bowled S, Camerer C, Fehr E, Gintis H, McElreath R, Alvard M, Barr A, Ensminger J *et al.*: **"Economic man" in cross-cultural perspective: behavioral experiments in 15 small-scale societies**. *Behav Brain Sci* 2005, **28**:795-855 http://dx.doi.org/10.1017/S0140525X05000142.