What Blood and Organ Donation Can Tell Us About Cooperation?

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In Press: Special Issues of Current Opinion In Psychology on Prosociality edited by Stefan Pfattheicher and Isabel Thielmann

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Abstract

High-cost cooperation directed towards strangers is difficult to explain from an evolutionary perspective. Here, it is argued that by studying the behaviours, motivations, and preferences of real-world high-cost cooperators – blood and organ donors – insights can be uncovered into the mechanisms supporting cooperation. In this respect, this paper details two novel mechanisms to enhance cooperation in the face of free-riding: (1) 'reactive reluctant altruism' whereby people help because they do not trust others to help and (2) the 'Good Shepherd' effect whereby cooperation is enhanced when people observed others cooperate although the social norm is to free-ride. Finally, repeated acts of high-cost cooperation are sustained by a self-selection process based on the reinforcing effect of warm-glow.

The high levels of cooperation observed within human societies are difficult to explain from an evolutionary perspective, especially when considering high-cost cooperation towards strangers [1]. In this paper, it is argued that studying the behaviours, motivations, and preferences of those who perform real-world acts of high-cost cooperation can offer novel insights into the mechanisms supporting cooperation [2], as well as an opportunity to test competing theories of cooperation [3]. While human cooperation can be defined in many ways [1, 4], we adopt a simple definition of cooperation as any behaviour whereby a donor, not only pays a cost but also gains personal benefit from helping [4] such as reputation gains, or feelings of warm-glow from giving [1, 5-7]. Blood and organ donor behaviour are explored as two examples of such real-world high-cost cooperation.

1.1.What Is Blood and Organ Donation?

1.1.1 Blood:

Whole blood is donated either by *voluntary non-remunerated blood donors* (VNRBD), *familial/replacement* donors (who donate blood to relatives), or paid donors [8]. The World Health Organization reports that 62 counties, out of 171 surveyed, have a 100% *voluntary non-remunerated* system [8]. Within a voluntary non-remunerated system, donors and recipients are completely *anonymous,* with approximately 3% of the eligible population donating at any one time [9]. Additional blood products are derived from plasma via *apheresis*[1] donations which are either voluntary or paid. Whole blood and plasma donations can be a one-off or the donor can choose to donate multiple times.

[1] *Apheresis* donation is where blood is drawn, platelets and plasma extracted, and the blood replaced in the donor minus these products.

1.1.2 Organs:

Organs donations can be either to a *stranger* or family member (*familial donation*). Stranger donations are either *posthumous* or as a *non-directed living* donor. *Familial* donation is an act of *living* donation that is *directed* to a matched relative. Posthumous organ donation operates under two different policies: opt-in or opt-out. Under the opt-in policy, the default is to be a non-donor and to actively register (opt-in), with, on average, 36% opting-in [10-11]. Under opt-out, the default is to be a donor with up to 6% actively opting-out [11]. Posthumous donations cover a wider range of organs and tissues (e.g., heart, lungs, corneas, skin, tendons) whereas living donations are of a kidney or a lobe of the liver or lung.

1.2 How Blood and Organ Donation Informs the Study of Cooperation: Structural and Psychological Characteristics

Detailed below are the structural and psychological reasons why studying blood and organ donation offers a unique opportunity to study cooperation.

1.2.1 Structural Characteristics

Structurally, volunteer, non-renumerated whole blood donation and non-directed living organ donations are analogues of anonymous dictator games, with donors giving to strangers with no opportunity for reciprocity. The potential to be a repeat blood donor allows researchers to explore, which of the proposed mechanisms of cooperation (e.g., reputation gain, warm-glow) predictors of the transition from a one-off act of cooperation to sustained high-cost cooperation [1, 5-7].

Posthumous organ donation under an opt-in policy is an analogue for public goods game (PGG). That is, while everyone can opt-in, not all do, but everyone can receive a transplant. An opt-out policy represents a resource dilemma, where everyone is a donor, but can opt-out and as such depletes the available resources.

Familial donation offers an analogue of gift exchange experiments, where the donor offers a 'gift' (organ or blood) to their relative [12-13]. This opens up the possibility to study *prosocial emotions* in donors (e.g., empathy, compassion) and recipients (e.g., awe, indebtedness, gratitude, guilt) as well as any *coercion* and *exploitation* of the donor [12-14]. Furthermore, familial donation offers a vehicle to tests models of kin selection [15-16]. For example, are people more willing to donate to a genetically close (sibling) rather than a genetically distant (2nd cousin) relative or a younger rather than an older relative? Inclusive fitness would predict a preference to donate to a generically close rather than distant relative as the donor and recipient share more genetic material that the recipient can potentially pass onto offspring. A preference should also be observed for donating to younger than older relatives as younger relatives have greater reproductive potential. It is also possible to explore if emotional closeness moderates any effects of genetic closeness [17]. Would a potential donor donate to a relative they did not like or were estranged from? From an inclusive fitness perspective, they should.

1.2.2 Psychological Characteristics

Psychologically, cost-benefit ratios vary across blood and organ donation. Costs are perceived a high for (1) blood donation (e.g., time, pain, blood loss) [18-19], (2) posthumous organ donation under an opt-in policy [20], and living organ donations (e.g., surgery, post-surgical recovery) [21-22]. Within living donations, donating a lobe of the liver is perceived as a higher cost than a kidney [23]. Conversely, posthumous donation under an opt-out policy is perceived as low-cost [20].

In terms of benefits, blood donors gain in terms of warm-glow [2, 24-25], as well as a positive reputation as a caring, healthy, and fit person [17]. The latter qualities make the donor a desirable mate [17, 26] and as such studying blood donation allows for tests of sexual

selection of cooperation [17, 27]. Living 'altruistic' donors benefit in terms of enhanced self-esteem and self-worth [21-22].

1.3 What's New?

Below are detailed some of the new ideas about cooperation that the study of blood and organ donation has revealed.

1.3.1 Reluctant Altruism

The concept of *reluctant altruism* has been proposed independently in two separate literature – blood donor research [2, 28-29] and behavioral economics [30]. These two versions of reluctant altruism focus on very different motivations/preferences to help. Thus, to avoid a 'jingle' fallacy (assuming concepts with the same name are the same and operate in the same way) [31] they need to be differentiated. Thus, both conceptualizations of reluctant altruism are described and differentiated below.

The original concept of *reluctant altruism*[2] was identified from clustering the motivations of new, novice, and experienced blood donors and referred to a motivation to help because the reluctant altruist *does not trust that others will help*, especially when levels of free-riding are high [2, 28-29]. Reluctant altruists see the cause as worthy and reluctantly initiate cooperation based on negative emotions (e.g., anger) directed towards those they do not trust to help [29].

The concept of *reluctant altruism* within behavioural economics describes a reluctant altruist who 'gives in' to *social pressure* placed on them to cooperate [30]. Within this

[2] Reactive reluctant altrusim is obserevd primarily in new and novice donors. At this stage of the donor career the donor is lilkey motivated to help and benefit the recipinet at a personal cost, as any petrsonal gains that the donor mayexperience are reported as motivations for later donations (e.g., warm-glow). As such, the term altruism is used here rather than cooperation as the donor in the early stage of their donor career is likely to experience graeter costs relatve to benefits [2, 53-54].

conceptualization the reluctant altruist does not want to help but feels coerced and 'gives in' and cooperates due to social pressure [30].

Both conceptualizations of reluctant altruism are correct but refer to very different contexts. One occurs when cooperation is not socially signaled (free-riding is high) and the reluctant altruist does not trust that others cooperate, so helps [2]. The other occurs when cooperation is socially signalled and the reluctant altruist 'gives in' and cooperates due to social pressure even though they do not want to help [30]. These two reluctant altruisms can be differentiated by considering the person's underlying *motivation to cooperate* (wanting to or not wanting to cooperate) and the *social norm to cooperate or not* (Table 1).

A social norm to cooperate is signalled by observing others helping or feeling pressured to help [30]. Conversely, a social norm that legitimizes not cooperating is signalled by high levels of free-riding (e.g., blood donation, opt-in organ donation, voting). Reluctant altruists who want to help and react against high-levels of fee-riding are termed 'reactive reluctant altruists' [2]. Whereas the reluctant altruists who do not want to help but 'give in' and help are termed 'coerced reluctant altruists' [30]. This scheme also identifies 'conditional cooperators' who are motivated to help in a social context that encourages cooperation – observing others giving [32] and 'incidental altruists' who are not motivated to help, and there is no social pressure to help, but they accidentally help. For example, throwing an old fridge in a skip (dumpster) and someone takes it and benefits from it.

'Reactive reluctant altruism' is of particular interest as it shows that a lack of trust and heightened anger motivate cooperation. This is in contrast to the standard model, where trust motivates helping [33], and anger at free-rider motivates costly-punishment, not direct cooperation [34]. Thus, the study of blood donation has identified a preference pattern that may have unlikely been observed through the standard study of cooperation. Indeed, reactive reluctant altruism may help to explain the 'humped-back' distribution observed in conditional

cooperation experiments [32: Figure 1, panel A]. In a conditional cooperation experiment participants play a PGG where they are aware of the average contribution of others in their group and then choose how much to contribute. The 'reactive reluctant altruist', who helps when they do trust others to help, should respond by cooperating when others are less likely to cooperate but once cooperation is established they should be less inclined to cooperate.

1.3.2 Good-Shepherd Cooperators and Lone-Wolf Defectors

Both injunctive norms (what people *ought to* do or is *approved of*) and descriptive norms (what people *actually* do: e.g., conditional cooperation) influence cooperation [35-36], Recent evidence, however, shows that these two types of normative information can interact, with injunctive norms for cooperation influencing the dynamic expression of conditional cooperation (descriptive norms) [37 see also 38]. This led to the identification of 'Lone-Wolf' and 'Good Shepherd' effects (Table 2). The 'Lone-Wolf' effect is a downward spiral in cooperation resulting from observing other's defect (descriptive norm) when the injunctive norm is to cooperate. Conversely, the 'Good Shepherd' effect is an increase in cooperation, after observing others cooperate when the injunctive norm is for non-cooperation (free-riding) (Table 2 & Figure 1 Panel B: [37]). Thus, the injunctive norm for cooperation frames how people interpret and respond to the descriptive norm that emerges from observing others either cooperate or free-ride [37].

These "Lone-Wolf" and "Good-Shepherd" effects were observed using a PGG to model deceased organ donor registrations under the dynamic change from opt-in and opt-out policies and visa-versa (Figure 1, Panel C). Opt-in and opt-out policies offer a way to compare injunctive norms for cooperation. That is, defaults are known to establish an injunctive norm [39-40] with the default for opt-in (everyone is assumed to be a non-donor) signaling an injunctive norm to *free-ride* and the default for opt-out (everyone is assumed to be a donor)

signaling *cooperation*. It is then possible to observe how people respond to other's decisions (descriptive norm) to cooperate or defect.

In this game, participants were formed into groups of 3 anonymous players and stayed in these groups for 22 rounds where participants made cooperation decisions (registering under opt-in and not de-registering under opt-out) and could update their decisions for 11 initial rounds under opt-in followed by 11 rounds under opt-out and visa-versa (*Order of default change*). Each round consisting of 3 games. Cooperation decisions were made public and participants could respond to other's decisions either (i) contingently after each game within a round (*individualistic feedback* [41]), or (ii) across rounds once final decisions within a round were made (*no individualistic feedback*). With no individualistic feedback participants only knew what others had decided at the end of the 3 games within a round. The *order of default change* and *feedback* were between-subject factors. The results showed that with individualistic feedback cooperation increased when the injunctive norm is to not cooperate (opt-in) and reduces when the injunctive norm is to cooperate (opt-out) (Figure 1 Panel B: [37]).

Practically these finding suggests that offering a facility (e.g., updating social media accounts) to allow people to publically signal that they have cooperated, especially in the face of free-riding (e.g., blood donation, opt-in organ donor, or COVID-19 vaccination in younger populations[3]), are likely to be successful to encourage cooperation [42-43]. These findings also provide a cautionary note for countries considering a move to an opt-out system. If 'Lone-Wolf' effects emerge from negative social media posts about opt-out organ donation this could lead to many people deregistering. This is of concern as recent evidence suggests opt-out policies may not offer an advantage over opt-in policy in terms of organ donation as

[3] Younger populations are more likley to show vaccination hesitatcny and as such have higher levels of free-riding.

was once believed [44] and levels of living donations go down under an opt-out policy [10, 44].

1.3.3 Initiating and Sustaining High-Cost Cooperation

Evidence from new and novice donors suggests that initiating high-cost cooperation is driven by mechanisms linked to trust, fairness, and reciprocity, but not warm-glow [45-47]. However, sustained repeat blood donation is driven by the reinforcing effects of warm-glow [24-25, 48-51]. Thus, while many attempt high-cost cooperation only a few sustain it with warm-glow operating as a self-selection mechanism. Thus, a self-selection model, based on warm-glow, has been proposed to explain sustained high-cost cooperation towards a stranger in the absence of other mechanisms to support cooperation (e.g., costly punishment) [1, 52].

1.4 Conclusions

In conclusion, studying blood and organ donation can help us better understand sustained high-cost cooperation and has identified two novel mechanisms for cooperation in the face of free-riding: ‘Good Shepherd’ effect and ‘reactive reluctant altruism’. Hopefully, this gives a flavour of what can be achieved and this will encourage other researchers to consider exploring how they can incorporate blood and organ donors into their research agendas on cooperation.

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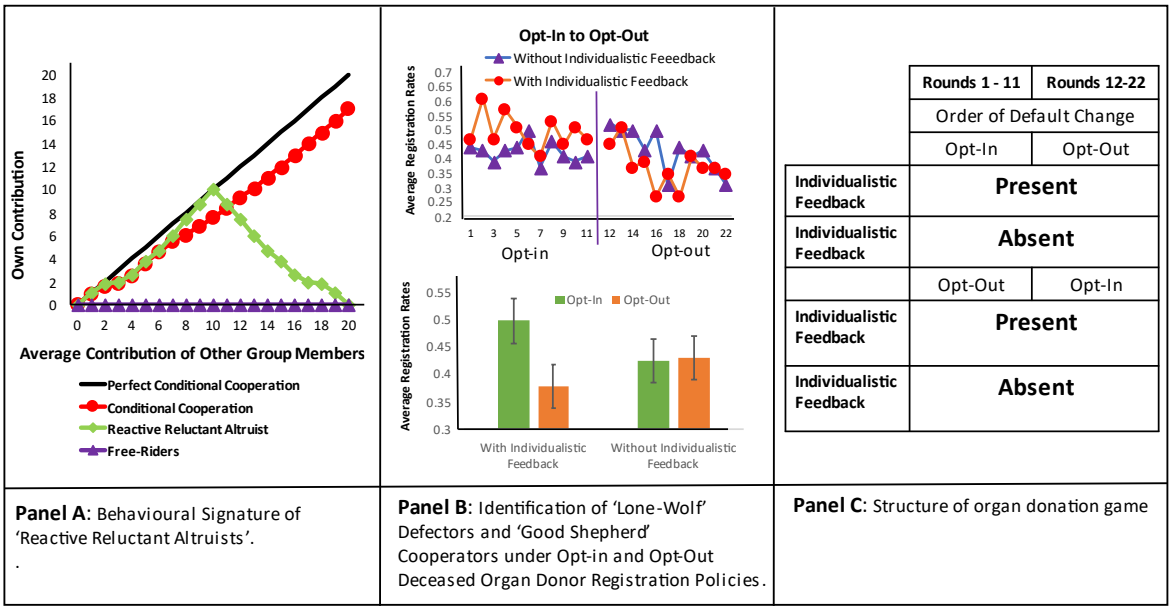
		Social Pressure	
		Free-Ride	**Cooperate**
Motivation to Help	**Want to Help**	Reactive Reluctant Altruist	Pure Cooperator ("Giving")
	Do Not want to Help	Incidental Altruist	Coerced Reluctant Altruist ("Giving-In")

Table 1: *Different Types of Helping as a Function of Social Pressure to Cooperate and Motivation to Cooperate.* This table shows how different types of helping emerge as a function of the helpers' motivation to help as a function of the social pressure they experience to help. When the social pressure (or social norm) is to help (i) those who do not want to help will help if they feel coerced and will reluctantly help (Coerced Reluctant Altruists), and (ii) those who want to help will help (Pure cooperators). When the pressure is to not cooperate (or the social norm is to free-ride) (iii) those who do not want to help may incidentally help (doing something that incidentally helps someone without intending to – see main text for example) and (iv) those who want to help will react against the fact that others are not helping and help because they do not trust other to help and are angry at the free-riders (Reactive Reluctant Altruist).

		Injunctive Norm		
		Cooperate	**Free-ride/Non-Cooperative**	**None**
Descriptive Norm	**Defect**	Lone-Wolf	Negative Conditional Cooperation	Negative Conditional Cooperation
	Cooperate	Positive Conditional Cooperation	Good Shepherd	Positive Conditional Cooperation
	None	Cooperate	Free-ride	Cooperate/free-ride

Table 2: *Effect of Injunctive and Descriptive Norms for Cooperation on Cooperative Behaviour*. This table details the type of cooperative behaviour that emerges as a function of information from injunctive (e.g., what people *ought* to do) and descriptive (i.e., what people *actually* do) norms for cooperation. When there is *no* injunctive norm to frame the cooperative context descriptive norms are the only source of information and people will show positive conditional cooperation (cooperate proportionally to others levels of cooperation) if others are observed to cooperates and negative conditional cooperation (defect proportionally to others levels of defection) if others are observed to defect, and in the absence of a descriptive norm cooperation behaviour will be based primarily on beliefs or traits. When the injunctive norm is to *not cooperate* and others defect, negative conditional cooperation will also occur as will free-riding in the absence of a descriptive norm. However, when others are observed to cooperate when the injunctive norm is to not cooperate 'Good Shepherd' cooperation will emerge whereby cooperation levels increase rapidly as others are observed to cooperate[33]. Finally, when the injunctive norm is to cooperate, positive conditional cooperation will occur when others are observed to cooperate and cooperation when there is no descriptive norm. However, when others are observed to defect, when the injunctive norm is to cooperate, 'Lone Wolf' defection will emerge whereby defection levels increase rapidly as others are observed to defect when the rule is to cooperate [33].



Panel A: Behavioural Signature of 'Reactive Reluctant Altruists'.

Panel B: Identification of 'Lone-Wolf' Defectors and 'Good Shepherd' Cooperators under Opt-in and Opt-Out Deceased Organ Donor Registration Policies.

Panel C: Structure of organ donation game

Figure 1: ***Panel A***: Stylized condition cooperation plot. ***Panel B***: This presents results from the opt-in to opt-out change (which is the most common change in the world) and there is an interaction between context (opt-in vs opt-out) and feedback (with and without individualistic feedback) such that with individualistic feedback cooperation increases under an opt-in free-riding context ("Good Shepherd' effect) and deceased under opt-out cooperative context ('Lone-Wolf' effect). See [37] for detail and game-theoretic proof. Error bars are 95% C.I.s ***Panel C***: Deceased organ donation game used to test 'Lone-Wolf' and 'Good-Shepherd' Effects [37]. In this game, participants were formed into groups of 3 anonymous players and stayed in these groups for 22 rounds. *Order of default change* and *individualistic feedback* were between-subject factors Participants could update their decisions to register for 11 initial rounds under opt-in (the social norm is to free-ride) followed by 11 rounds under opt-out (the social norm is to cooperate) and visa-versa. Within each round participants played up to 3 games where they could update their cooperative decision to either register under opt-in or not de-register under opt-out. These updates were made public in terms of individualistic feedback whereby participants could update their decisions based on other's decisions across the 3 games within a round. This is akin to the use of social media for people to update their status. In the absence of individualistic feedback participants, only knew what others had decided at the end of the 3 games within a round [37].