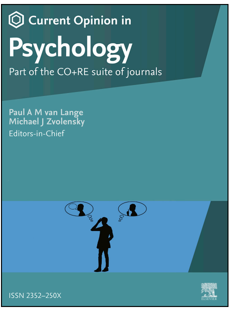

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Reward, Punishment, and Prosocial Behavior: Recent Developments and Implications

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Abstract (115 words)

Reward and punishment change the payoff structures of social interactions and therefore can potentially play a role in promoting prosocial behavior. Yet, there are boundary conditions for them to be effective. We review recent work that addresses the conditions under which rewards and punishment can enhance prosocial behavior, the proximate and ultimate mechanisms for individuals' rewarding and punishing decisions, and the reputational and behavioral consequences of reward and punishment under noise. The reviewed evidence points to the importance of more field research on how reward and punishment can promote prosocial behavior in real-world settings. We also highlight the need to integrate different methodologies to better examine the effects of reward and punishment on prosocial behavior.

Keywords: reward, punishment, sanctions, reputational benefits, prosocial behavior

Highlights (optional)

- Both reward and punishment can promote prosocial behavior but are costly to enact.
- Reward is less costly than punishment to implement when prosociality is rare.
- Decisions to reward and punish are driven by different emotions and motives.
- How reward and punishment operate under noise is important to address.

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1. Introduction

Prosocial behavior refers to a broad category of behaviors (e.g., helping, volunteering, charitable donation, and cooperative behavior) that are generally beneficial to others but often at a personal cost to the actor [1]. Prosocial behavior is critical for interpersonal relationships, groups, and societies at large to function well. For instance, engaging in prosocial behavior can enhance the actor's well-being [2,3], can improve employees' performance in organizational settings [4], and is critical to solve global social dilemmas, such as climate change and mitigating pandemics [5,6]. Researchers across different disciplines have examined the antecedents of prosocial behavior. In particular, reward and punishment have been identified as two major structural solutions that change the payoffs of different courses of actions and thus can promote prosocial behavior [7,8].

Reward and punishment are both temporarily costly actions that result in an immediate benefit or cost for the rewarded or punished target, respectively. Reward is typically targeted at prosocial actors, whereas punishment is more often levelled at free riders in social interactions [8–10]. Early research focused mainly on whether reward and punishment can increase prosocial behavior, often in laboratory experiments using social dilemma paradigms (e.g., public goods game; see Figure 1 for illustrations) [11,12], and a large-scale meta-analysis indicated that reward and punishment have similar-sized positive effects on prosocial behavior [7]. Yet, a closer examination of existing studies shows mixed evidence [10,13], suggesting that there might be boundary conditions for reward and punishment to be effective.

In this review, we summarize recent developments pertaining to three major questions (see Figure 2 for an overview): (a) do reward and punishment promote prosocial behavior and, if so, when? (b) why and when are people willing to reward or punish? (c) what are the reputational and behavioral consequences of reward and punishment under noise? We end by discussing the implications of these developments for future research.

2. When do reward and punishment promote prosocial behavior?

Reward and punishment are both behaviors that require the actor to pay a short-term cost, but they differ in the consequences for the target: reward generates immediate payoffs for the target, whereas punishment does the opposite. Hence, punishing free riders typically reduces collective payoffs and thus can often be less efficient than simply withholding help from free riders [9]. In addition, punishment can sometimes prompt retaliation rather than prosocial behavior in public goods games, thereby lowering contributions to public goods [10,14]. This negative consequence is particularly likely when punishment behaviors are believed to stem from malign motives [15] or perceived to be less legitimate [16]. For instance, punishment enacted by an uninvolved bystander (third-party punishment) or through a democratic process of majority vote (democratic punishment) are both typically perceived as more legitimate than direct punishment by the targets' interaction partner(s), and may therefore be more likely to induce targets' prosocial behavior (for a review, see [10]).

Some studies have found that reward can be more likely than punishment to promote prosocial behavior, such as inducing more contributions to public goods [17]. However, both reward and punishment can also have negative effects, such as crowding out individuals' intrinsic motivation to act prosocially [18,19]. Moreover, although third-party reward (i.e., an uninvolved bystander rewards a prosocial actor), also known as indirect reciprocity, can theoretically maintain prosocial behavior among unrelated strangers, there has been no consensus on what social rules that people use to assess others' actions (e.g., whether helping a free rider is good and deserves to be rewarded) can best promote prosociality through indirect reciprocity [20]. In order for indirect reciprocity to sustain prosocial behavior, theoretical models require that individuals should discriminate between justified defection and unjustified defection, such that an actor who refuses to help a free rider is perceived as good and gets rewarded [21]. Yet, recent evidence suggests that people evaluated justified defectors as neither good nor bad [22], which deviates from theoretical predictions. As a result, it is unclear whether in the real world, such social rules are frequently used and work effectively to sustain prosocial behavior through indirect reciprocity.

Notably, punishment and reward may be most effective when they are used in tandem, rather than separately. In particular, theoretical evidence from evolutionary models shows that reward is essential to establish prosociality when prosociality is rare in the group, whereas punishment is instrumental to maintain prosociality when the number of prosocial actors exceeds a certain threshold [5,23].

3. Why and when are people willing to reward or punish?

Here we ask what proximate and ultimate mechanisms underpin individuals' tendency to reward or punish others in social interactions (see Figure 2 for an overview). One general finding is that when given the choice, people typically prefer to reward prosocial actors (or to perform other positive actions such as compensating the victim) than to punish norm violators [24–26]. Rewarding decisions by third-party observers may be prompted by the positive affect they experience when they learn about others' prosocial behavior, and this positive affect may prompt their decisions to reward those prosocial actors [27]. People are also more prone to reward prosocial actors who are authentically motivated to care about others' welfare and are perceived as genuinely moral, such as when prosocial acts are targeted at lower-power recipients (see Figure 2) [28]. Notably, individuals who reward prosocial actors or compensate the victim are more positively evaluated by third-party observers and are also more likely to be chosen as potential interaction partners than punishers [29–31]. Such opportunities for reputational benefits may help illuminate the ultimate (evolutionary) explanations for why people are willing to pay to reward prosocial actors.

In contrast to rewarding decisions, more research has focused on the motives prompting punishment decisions. Evidence suggests that people willingly pay to punish norm violators in experimental settings and such punishment is subjectively rewarding [32]. Negative emotions, particularly anger and moral outrage, seem to reliably predict punishment decisions [33–35], including third-party punishment [36]. Indeed, introducing a time delay between norm violations and punishment decisions has been found to reduce punishment behavior [37], which is consistent with the idea that punishment is prompted by negative emotions. Similarly, evidence suggests that people also punish less often and more mildly when they make punishment decisions before (instead of immediately after) the occurrence of others' norm violations [38]. But not all punishment is motivated by anger: For example, third-party punishment can also be motivated by compassion toward the victims [39], as well as punishers' incidental feelings of gratitude induced by recalling past events (e.g., recalling a time that they were grateful) [40].

Some recent studies also suggest that people tend to attune their punishment decisions to the potential benefits of changing the target's behavior and the costs of potential retaliation [34]. For instance, people are more likely to engage in third-party punishment to deter the target from acting against their own interests when they expect future interactions with the target [41,42]. People are also more likely to punish when they value the victims' welfare and perceive that the harm to the victims has produced a net cost to themselves (i.e., the punisher has a stake in the victims' welfare), for example, when the victims are their siblings and close friends rather than their acquaintances [33,43]. In addition, people with higher power or social status, who are less likely to be retaliated against, are expected to punish [44] and are indeed more willing to punish norm violators [34,45].

Finally, individuals' group membership can affect when and how they choose to reward or punish others. As third-party observers, people tend to punish selfish behaviors committed by outgroup members more harshly than similar behaviors committed by ingroup members, which helps protect their ingroup members from exploitation or harm by the outgroup in the future [41,46]. Also, during intergroup conflicts, people are often more willing to punish free riders and reward cooperators within their group at some personal costs, because this enhances within-group cooperation, thereby making group success more likely (see Figure 2) [47].

The ultimate causes for punitive sentiment to be under positive selection also include the opportunities for reputational benefits (particularly for third-party punishers) [48], but some punishment may also be favored because it improves the punisher's payoffs or status relative to the payoffs or status of the target [10,49].

4. Reward and punishment under noise

Experimental research often assumes perfect monitoring, such that everyone can observe everyone else’s actual behavior and can reward or punish appropriately [11,12]. Yet, real-life social interactions often contain “noise”—unintended errors that cause discrepancies between intended outcomes and actual outcomes [50]. Such noise may cause imperfect monitoring and false reputations (e.g., prosocial actors are perceived as free riders), and mislead people to reward prosocial actors who are actually free riders and to punish free riders who are actually prosocial actors. Inappropriate rewarding and punishing behaviors caused by noise may eventually undermine prosocial behavior and affect the reputations of rewarders and punishers. For instance, studies exploring how leaders’ reputations are affected by noise-induced mistakes in punishing or rewarding others found that mistaken punishment damages leaders’ reputation, whereas mistaken reward does not [51]. This may occur because punishment is a harmful act and is therefore judged more negatively than reward when it is applied inappropriately. Moreover, noise may hinder the positive effects of reward and punishment on prosocial behavior. For instance, when there is a higher degree of noise, people tend to increase their punishment expenditures, but punishment cannot maintain a high contribution level and even harms group payoffs in such situations due to the possibility of mistakenly punishing high contributors [52]. Other evidence from evolutionary models on institutional reward and punishment suggests that for intermediate and high levels of noise, reward performs best in eliciting higher contribution levels and group welfare, whereas punishment fails to maintain a high contribution level and thereby reduces group welfare [53].

Undoubtedly, to better understand how reward and punishment can be used to promote prosocial behavior in real-life situations, it is important for future research to pay more attention to the effects of reward and punishment on prosocial behavior under noise, which have been relatively understudied (see Figure 2). It is also important to note that people in real-life situations can also learn about others' behavior through gossip when they cannot directly observe these others' behavior. Gossip may be best able to overcome the problem of noise when it comes from multiple independent sources [54].

5. Implications and conclusions

Existing research on reward and punishment, largely relying on evolutionary models and laboratory experiments, has suggested that reward and punishment are generally effective means to promote prosocial behavior. Yet, peer punishment seems to work less efficiently than reward and other forms of punishment, such as third-party punishment and democratic punishment [5,55–57]. Notably, punishments enacted in the laboratory often differ from those observed in real-life social interactions (e.g., [43,58]), because people in real-life situations can often intervene in multiple ways, including through direct physical or verbal confrontation, and indirect reputation-based strategies, such as social avoidance and gossip [34]. Both field and laboratory studies have shown that gossip and social image concerns can promote prosocial behavior more efficiently than punishment [59,60]. It is possible that people may first gossip about others' norm violations and then coordinate their punishment behaviors if gossip alone does not work. In addition, how reward works compared to indirect strategies (e.g., social avoidance and gossip) has been relatively understudied. Future research can use multi-trial tasks to examine the dynamic changes in the uses of reward, punishment, and indirect reputation-based strategies, and how they can be combined to more efficiently promote and sustain prosocial behavior.

Another observation from this selective review is that there has been a plethora of research using evolutionary models to investigate the optimal conditions for reward and punishment to promote and sustain prosocial behavior [5,23,53,61]. However, whether results from evolutionary models can accurately reflect individuals' behavioral patterns in experiments and real-life interactions remains unknown. For example, although modeling results suggest that the best strategy to solve social dilemmas is to use reward first and then switch to punishment when the number of prosocial actors reaches a certain threshold [5,23], this prediction has not yet been tested in empirical studies. To provide more useful insights for policy makers, future research needs to integrate modeling approaches with behavioral and field studies to generate more ecologically valid and robust findings with regard to the effectiveness of different structural solutions.

To conclude, despite the overall effectiveness of reward and punishment in promoting prosocial behavior, we should be aware of the boundary conditions for them to work effectively without harming collective welfare. In addition, decisions to reward and punish are driven by different emotions and motives, which can provide useful insights into how to encourage the provision of reward and punishment systems to enhance prosocial behavior. Notably, more field research is needed on how reward and punishment, compared to indirect reputation-based strategies such as social avoidance and gossip, promote prosocial behavior in "noisy" real-world settings.

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Conflict of interest statement

Nothing declared.

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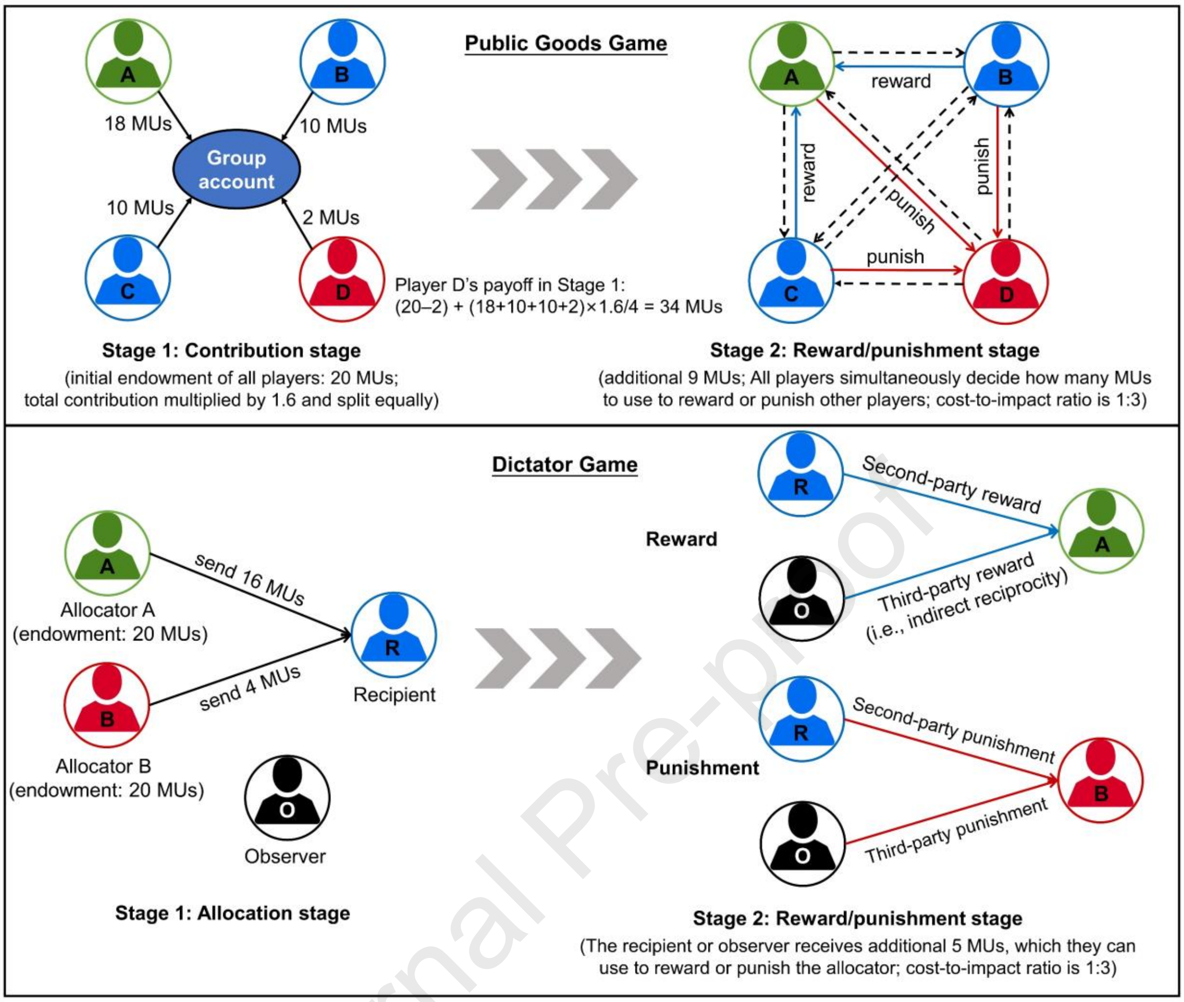
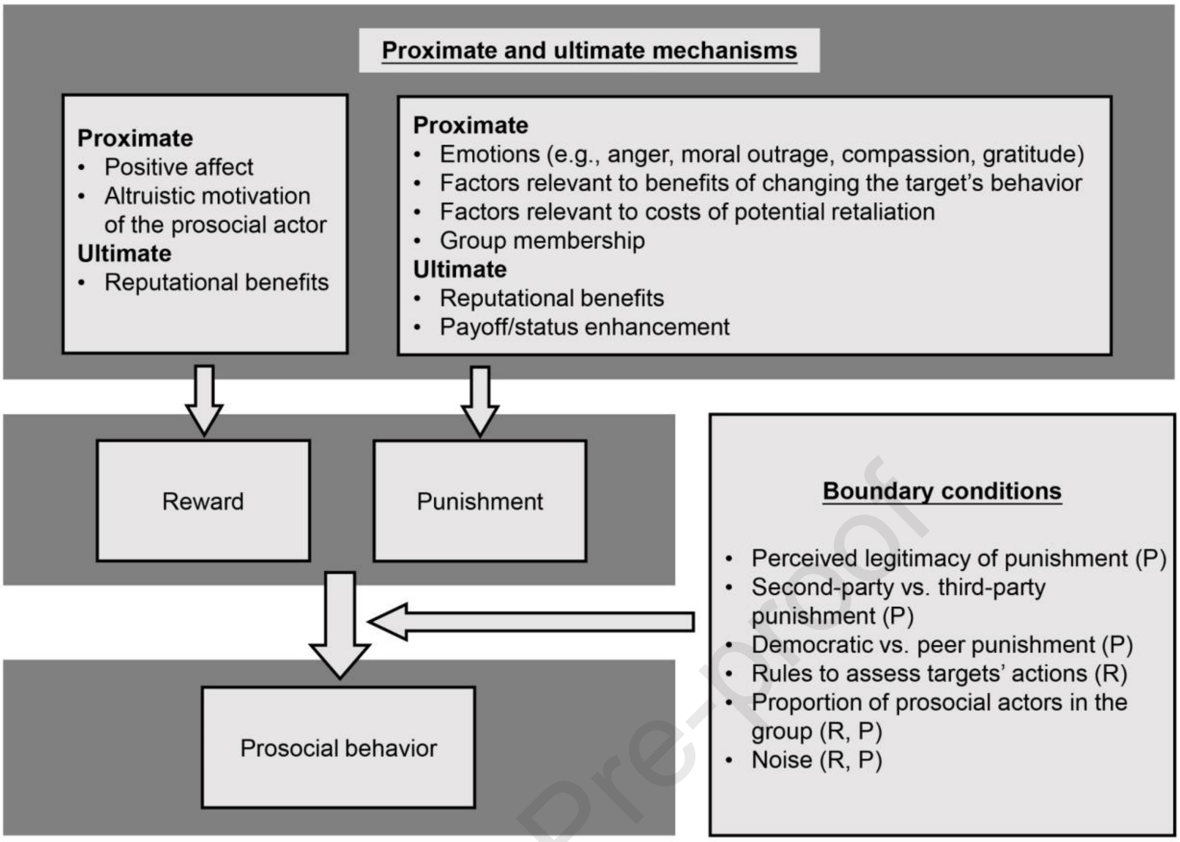

Public Goods Game
A
B
C
D
18 MUs
10 MUs
10 MUs
2 MUs
Group account
Player D's payoff in Stage 1:
(20–2) + (18+10+10+2)×1.6/4 = 34 MUs
Stage 1: Contribution stage
(initial endowment of all players: 20 MUs;
total contribution multiplied by 1.6 and split equally)
reward
reward
punish
punish
punish
Stage 2: Reward/punishment stage
(additional 9 MUs; All players simultaneously decide how many MUs
to use to reward or punish other players; cost-to-impact ratio is 1:3)
Dictator Game
Allocator A
(endowment: 20 MUs)
Allocator B
(endowment: 20 MUs)
send 16 MUs
send 4 MUs
R
Recipient
O
Observer
Stage 1: Allocation stage
Reward
Second-party reward
Third-party reward
(i.e., indirect reciprocity)
Punishment
Second-party punishment
Third-party punishment
Stage 2: Reward/punishment stage
(The recipient or observer receives additional 5 MUs, which they can
use to reward or punish the allocator; cost-to-impact ratio is 1:3)

Figure 1. Illustrations of payoff structures in a public goods game and a dictator game, and the administration of reward and punishment in these games. Reward: assigning 1 MU to a target costs the rewarder 1 MU, and benefits the target by 3 MUs; Punishment: assigning 1 MU to a target costs the punisher 1 MU, and costs the target by 3 MUs. MU = monetary unit.



Proximate and ultimate mechanisms
Proximate
• Positive affect
• Altruistic motivation of the prosocial actor
Ultimate
• Reputational benefits
Proximate
• Emotions (e.g., anger, moral outrage, compassion, gratitude)
• Factors relevant to benefits of changing the target's behavior
• Factors relevant to costs of potential retaliation
• Group membership
Ultimate
• Reputational benefits
• Payoff/status enhancement
Reward
Punishment
Prosocial behavior
Boundary conditions
• Perceived legitimacy of punishment (P)
• Second-party vs. third-party punishment (P)
• Democratic vs. peer punishment (P)
• Rules to assess targets' actions (R)
• Proportion of prosocial actors in the group (R, P)
• Noise (R, P)

Figure 2. Overview of the proximate and ultimate mechanisms of rewarding and punishing decisions, as well as the boundary conditions for the effects of reward and punishment on prosocial behavior. R = applies to reward, P = applies to punishment.

Credit Author Statement

Junhui Wu: Conceptualization, Writing – original draft, Visualization. **Shenghua Luan:** Writing – review & editing. **Nichola Raihani:** Conceptualization, Writing – review & editing.

Declaration of interests

☒ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☐The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: