

More order with less judgment: An optimal theory of the evolution of cooperation

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The study of Tatsuya Sasaki suggests that the practice of avoiding moral assessments can be the best policy when assessing those who refuse to help wrongdoers. Copyright: University of Vienna/Barbara Mair

A research team led by mathematician Tatsuya Sasaki from the University of Vienna presents a new optimal theory of the evolution of reputation-based cooperation. This team proves that the practice of making moral assessments conditionally is very effective in establishing

cooperation in terms of evolutionary game theory. 'Our study also demonstrates the evolutionary disadvantage of seeking reputation by sanctioning wrongdoers,' says Sasaki. The results of the study were published in *Scientific Reports*.

Moral systems are key to distinguishing between "good" and "bad" and are essential to the establishment of social orders. For instance, a rule of thumb for maintaining cooperation within a sizable group is to help those who have a good reputation and avoid those who seem bad. However, the moral standard for what is good and what is bad is not necessarily unique and often diverges across societies.

"What moral standards best promote cooperation among those who are willing to freeload on others' efforts?" Sasaki asks. "There is no definitive consensus on the question, and it remains unclear even how those who refuse to help the bad should be assessed."

To address these issues, Tatsuya Sasaki collaborated with colleagues Isamu Okada from Soka University and Yutaka Nakai from the Shibaura Institute of Technology in Japan. These researchers adopted a new approach, one that is different from the traditional assessment rules that are based on compulsory moral assessment.

Their results unveil a new champion of moral assessment rules, referred to as "Staying". Sasaki and colleagues examined the Staying rule by applying the helping game of two persons (a mover and a receiver). They consider two different types for the person on the moving end, "freeloading" that is to refuse to help, whoever the opponent, and "cooperation" that is to help when the opponent has a good reputation or to refuse to help when the opponent has a bad reputation.

They define the moral assessment rule for "Staying", as follows. When the person on the receiving end has a good reputation, the Staying rule

assesses the person on the moving end, who either helps or refuses to help, as good or bad, respectively. This is necessary to stabilize cooperation once it has been established.

In striking contrast to more traditional rules, "under Staying", if the potential receiver has a bad reputation, the reputation of the person who helps remains the same as in the prior assessment. In this case, a choice about whether or not to render aid to the potential receiver does not affect the reputation of the potential mover.

A game-theoretical analysis demonstrates - for the first time - that the Staying rule, in which the assessment system avoids making moral assessments in specific cases, is more effective in establishing [cooperation](#) as compared to traditional assessment rules. Indeed, under the Staying rule, good cooperators can proliferate no matter how many freeloaders surround them, so long as the error rate is sufficiently small.

This study suggests that the practice of avoiding moral assessments can be the best policy when assessing those who refuse to help ("punish") wrongdoers. "Reputation-seeking punishment, described as 'I'll punish your bad behavior to make me look good,' may not be the best way to subvert a population of freeloaders," says Sasaki.

This study has important implications for various contemporary issues, including the potential applications of artificial intelligence (AI) in terms of decision-making. "The results of future work that examines whether AI can learn to avoid making [moral](#) judgements will be fascinating," says Sasaki.

More information: Tatsuya Sasaki et al, The evolution of conditional moral assessment in indirect reciprocity, *Scientific Reports* (2017). [DOI: 10.1038/srep41870](https://doi.org/10.1038/srep41870)

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