

# Carrot or stick? Game-theory can optimize collaboration

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Credit: University of Vienna

What motivates people to cooperate in collaborative endeavors? "First carrot, then stick". Tatsuya Sasaki, mathematician from the University of Vienna, has put forth for the first time ever a mathematical proof of this process. The study is recently published online in the *Journal of the Royal Society Interface*.

The new study establishes that the best combination for incentives and punishment that promotes cooperation are in the form of "First carrot, then stick". The [mathematical proof](#) shows how the combined sequential use of reward ("carrot") and punishment ("stick") promotes cooperation in collaborative endeavors, such as protecting social commons and maintaining mutual aid.

Rewards and punishments are the most tried and true approaches when trying to promote cooperation in collaborative endeavors. New research, in terms of evolutionary game theory, is examining a mixed policy of reward and

punishment. In contrast, previous studies have only focused on either reward or [punishment](#). As is well known, incentives can be costly and can be adjusted depending on a situation.

In this paper, Sasaki and his colleagues have taken a different approach and investigated what happens when maximizing evolutionary forces towards cooperation. Through game-theory analysis, the study finds that the best approach is to first reward minor cooperators, and then when a critical mass of cooperators is reached, completely switch to punishing free riders.

How is this applicable to contemporary issues? Take automobiles as an example where this hybrid approach can be implemented. Those who currently drive powerful gas-guzzling vehicles should switch to different engines and fuels that are more environmentally friendly. Sasaki and his colleagues mathematically show that a "first [carrot](#), then stick" policy can drive [cooperation](#) toward a specific goal. "We have optimized the adaptive dynamics under a centralized incentive system. Therefore, fascinating future work would investigate how and when individuals voluntarily delegate the incentive control to a central authority", says Sasaki.

**More information:** Chen X, Sasaki T, Brännström Å, Dieckmann U. 2015: First carrot, then stick: how the adaptive hybridization of incentives promotes cooperation *The Journal of the Royal Society Interface*. December 2014. [dx.doi.org/10.1098/rsif.2014.0935](https://doi.org/10.1098/rsif.2014.0935)

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