Replication of Morris et al. 2017
"Evolution of flexibility and rigidity in retaliatory punishment"
PNAS 114(39), 10396-10401.
https://www.pnas.org/content/114/39/10396

The original paper only includes one experiment. In this experiment, participants play repeated steal/punish games. In each round, participants are randomized to play either as "thieves" or as "victims". The opponent is rigid in their stealing or punishing behavior (i.e., they follow the strategy to always steal or always punish theft). Participants can choose their actions with full knowledge of how their opponent previously has played. Participants who play in the role of thieves act relatively flexibly in their stealing behavior while participants who play in the role of victims act relatively rigidly in their punishment behavior.

Hypothesis to replicate and bet on: In repeated games against rigid opponents, participants assigned to be thieves act relatively flexibly in their stealing behavior while participants assigned to be victims act relatively rigidly in their punishment behavior. The authors test the above hypothesis through an interaction between role and round in a mixed-effects model using a likelihood ratio test ($\chi^2(1) = 24.3$, $p < 0.001$); p.10399.

Criteria for replication: The criteria for replication are an effect in the same direction as the original study and a p-value < 0.05 in a likelihood ratio test.

Power analysis: The original study had 100 participants after exclusion. The standardized effect size (Cohen's d) was $d = 0.986$. To have 90% power to detect 67% of the original effect size, a sample size of $n = 98$ is required. Since we require the replication sample size to be at least as large as in the original study, the replication experiment will use a sample size of $n = 100$ and the power will thus be >90% to detect 67% of the original effect size.

Sample: The original paper mentions no restrictions on who could participate. We will make sure that participants can only participate once from the same account in this specific study, and we will only recruit participants with a HIT approval rate of 95% or above. We will also check all IP addresses via https://www.ipqualityscore.com/; and we will remove any participants where one or more of the following is true: fraud score >= 85; TOR = True; VPN = True; Bot = True; abuse velocity = high. The replication sample size is the sample size after any exclusions of participants.

Materials: We will use the same material as in the original study, kindly provided by the original authors. In particular, the experiment will be conducted using the original Javascript file.

Procedure: We will follow the original study as closely as possible. The following summary of the experimental procedure is therefore largely based on the description of the experiment in the article (pp. 10399-10400) and the section "Materials and Methods" (p. 7).

Participants will first be shown a Captcha, and will thereafter provide informed consent. After this we will include an attention check that participants will need to pass to continue to the study. This attention check is in addition to any other potential attention check(s) used in the original study. Participants will be randomly assigned to the thief or victim role in repeated steal/punish games. Each participant will play one focal game against a rigid opponent who always steals/punishes (as either thief or victim) and two background games against the other

opponent types (one as thief, one as victim). The game order will be varied between participants and controlled for in the analysis: the focal game will last 20 rounds while the background games last a random number of rounds, chosen uniformly between 10 and 20. Participants will not know the game lengths. In each round, participants will be presented with a choice of two (neutrally labeled) actions: steal (+2 cents to you and −2 to partner) or do nothing (0 to both) when thief, and punish (−1 cent to you and −3 to partner) or do nothing when victim. They will then be informed of their partner's decision. (When playing as victim, participants are told whether their partner stole before deciding whether to punish.) The study focuses on the behavior of the freely acting participant when facing rigid opponents.

Analysis: The analysis code was kindly provided by the original authors. The analysis will be performed as in the original paper, using a mixed-effects model and testing the interaction role x round with a likelihood ratio test.

Subject payments: We are standardizing payments across all replications so that studies have a certain show-up fee depending on the expected length of the study, with an hourly wage from the show-up fee of $8 and a minimum payment of $1 (for studies with incentive payment we use the same incentive payment as in the original study; and this payment is paid in addition to the show-up fee). If we have problems recruiting, we will increase the show-up fee.