Decoupling altruistic punishment: immune punishers learn to not cooperate, but still punish hypocritically.

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ABSTRACT

Economic experiments, and evolutionary models, have suggested that human cooperation is sustained by altruistically motivated cooperators paying to punish non-cooperators. Consequently, punishment allows cooperators to happily match each other (conditionally cooperate), confident that they will not be exploited by non-cooperators. However, it is not clear that punishment is altruistically motivated, and previous experiments have confounded a fear of being punished with being surrounded by cooperators. Here, we experimentally decouple the fear of punishment from a cooperative environment and allow cooperation and punishment to freely separate (420 participants). We show, that if a minority of individuals are made immune to punishment, they (1) learn to stop cooperating despite being surrounded by high levels of cooperation; and (2) continue to punish, ‘hypocritically’, showing that cooperation and punishment do not form one, altruistically motivated, linked trait. Overall, 48% of punishers were ‘anti-social’ during the experiment, suggesting humans are not in general altruistic punishers.

INTRODUCTION

Economic games are frequently used to test if humans are willing to make personal sacrifices for the greater good (to cooperate). The public goods game is designed to resemble individual decision making in social dilemmas requiring collective action. For example, outside the laboratory, if individuals limit their carbon footprint, voluntarily pay all their taxes, and/or practise social distancing during a pandemic, they pay a cost to benefit society. In the experiment, individuals have to decide how much to they want to contribute (to cooperate) to a group fund that benefits all group members equally, regardless of their contribution. The game is typically designed so that individuals do best by not contributing but contributing fully is best for the group. The robust finding is that average contributions start at intermediate amounts (40-45%), but then gradually decline as the game is repeated ¹⁻⁴, unless individuals can pay to inflict fines upon other individuals (to ‘punish’), which stabilizes contributions ^{5,6}.

A common explanation for these results is that (1) most people, motivated by a desire for fair outcomes, sacrifice their personal gain to match the contributions of others (‘Conditional Cooperators’) ^{7,8}; (2) contributions decline in games without punishment because conditional cooperators reluctantly reduce their contributions in response to a minority of individuals

who do not match back ('Free Riders')^{9,10}; and (3) costly punishment stabilizes contributions because conditional cooperators are willing to pay to discipline Free Riders ('Altruistic Punishment')⁶. Consequently, the argument goes, conditional cooperators, no longer worried about Free Riders, can continue to contribute at high levels⁸. Leading some to suggest that governmental policies should aim "to provide opportunities for the public-spirited to punish free riders" rather than rely on institutional incentives^{11,12}.

This 'Altruistic Punishment' hypothesis (also known as the 'Strong Reciprocity' hypothesis¹³) has two key parts: that cooperators sacrifice personal gain to (1) achieve fair outcomes and (2) to punish non-cooperators^{6,14,15,16,17,18}. Experiments have shown that punishment is mostly directed towards below average⁶, or relatively lower¹⁹, contributors, consistent with the Altruistic Punishment hypothesis. Consequently, evolutionary models assuming these two traits, contributing and punishing, stem from one conjoined, altruistic, trait have been proposed as explanations for the evolution of a uniquely human cooperation between non-relatives^{15-17,20}.

However, it is not clear that punishment, whereby one individual pays to harm another individual, is altruistically motivated^{6,21-26}. Furthermore, the apparent linkage between cooperation and punishment, often assumed in evolutionary models, may be an artefact of an experiment design which couples a cooperative environment with a fear of being punished. This is because everyone can be punished, and punishment is very common, with more than 80% of individuals punishing someone⁶. Such a hostile environment is perhaps more consistent with a war of attrition, rather than a pro-social paradise. Individuals may therefore be maintaining their levels of contribution simply to avoid punishment, and not because they want to match the contributions of others, as has been assumed. What is required is an experiment design that removes an individual's fear of being punished, while maintaining their confidence that other Free Riders will be punished and that contributions will be stable. This will decouple concerns for fairness from a fear of punishment.

If an individual is made immune from the threat of punishment, yet altruistically motivated, then they will behave the same as when not immune. This means they will continue to match the contributions of their groupmates and to punish lower contributors. In contrast, if individuals are instead motivated by personal gain, but require experience to learn how to play the game, then immune individuals will learn to (1) reduce their contributions despite

high levels of contributions among their groupmates ('Confused Learners' hypothesis ²⁷⁻³⁷), and yet (2) they may still punish relatively low contributors, even if they themselves are hypocritically contributing even less, demonstrating that cooperation (contributing) and punishment are not linked traits.

We tested between these two hypotheses (Altruistic Punishment versus Confused Learners) by replicating the seminal study of altruistic punishment but with one key modification (Figure 1). Instead of letting all participants pay to punish each other ('Mutual Punishers' scenario), we make one groupmember permanently immune to punishment ('Immune Punisher' scenario). This immune groupmember can still pay to punish others but is free from the threat of punishment ³⁸. The immunity status is constant for the duration of the experiment, allowing us to test if immune individuals, no longer frustrated with non-cooperators, will continue to follow the social norm (Altruistic Punishment hypothesis), or whether they will learn to exploit their immunity and to contribute less (Confused Learners hypothesis). As a control, we include a scenario where the immune punisher is the sole groupmember that can pay to punish in the group ('Sole Punisher' scenario) ³⁹⁻⁴¹, allowing us to test if immune punishers free ride on the punishment of others when they are not the sole potential punisher.

RESULTS

Immune individuals contributed significantly less over time

We had individuals play a public goods game in groups of four individuals for five rounds, and group compositions were changed after each round in a way that ensured no two individuals ever interacted more than once ('perfect stranger' mechanism ^{5,6}). Contributing to the public good was personally costly (net loss of -0.6 MU per MU contributed) but benefited the other three group members (+0.4 MU per groupmember per MU contributed). This meant the income maximizing decision for an individual was to not contribute, but the group income maximizing decision was for all individuals to contribute fully (20 MU each).

When all four groupmembers could punish, median contributions remained between 8-9.5 out of 20 MU, and the mean contributions were stable between 42-45%, showing no significant decline over time (Mutual-Punishers, N = 80 individuals across four sessions; glmer: generalized linear mixed model with binomial link function controlling for session and participant; round estimate = -0.02 ± 0.019 , z value = -1.16, P = 0.247; Figure 2,

Supplementary Figures 1 & 2). In contrast, when one groupmember was given permanent immunity from punishment, they significantly decreased their mean contributions over time, from 31% to 17%, consistent with the Confused Learners hypothesis (Immune-Punisher, N = 42 immune individuals across 8 sessions; glmer: round estimate = -0.32 ± 0.033 , z value = -9.96, $P < 0.001$; Figure 2, Supplementary Figures 1 & 2).

Although the non-immune individuals also significantly decreased their contributions, the decline was minor, with the mean decreasing just slightly from 41% to 35%, significantly less than the decline among the immune individuals (Immune-Punisher, N = 42 immune and 126 non-immune individuals across 8 sessions; glmer: round*immunity = -0.25 ± 0.036 , z value = -6.93, $P < 0.001$). Consequently, by the final round of the game, the differences were stark, with the median contribution for immune individuals having gone from 5 to 0 MU, compared with from 8 to 7 MU for non-immune individuals.

A similar dynamic occurred in the Sole Punisher scenario, where only one groupmember could punish, and was therefore automatically also immune. In this scenario, the immune individuals again showed a significantly greater decline in contributions, from 40% to 12%, although the non-immune individuals also showed a large decline, from 46% to 25% (Sole-Punisher, N = 43 immune and 129 non-immune individuals across 8 sessions; glmer: round*immunity = -0.23 ± 0.035 , z value = -6.69, $P < 0.001$). Again, median contributions of immune individuals bottomed out by the final round, decreasing from 7 to 0 MU, whereas non-immune individuals were consistently higher, decreasing from 10 to 4 MU (Figure 2, Supplementary Figures 1 & 2).

Immune Conditional Cooperators did not match the social norm

We then controlled for the possibility that the lower contributions of immune individuals were simply due to non-cooperators (“Free Riders”) switching strategy depending on whether they could be punished or not¹⁸. To enable this, we used an established protocol, the strategy method, before the game, on most of our participants (N = 380/420) to classify each individual as either a Conditional Cooperator or a Free Rider (or Other)^{7,42}. This allowed us to repeat the above analysis, but on just those immune individuals that were classified as Conditional Cooperators, who, according to the Altruistic Punishment hypothesis, should continue to follow the social norm and not exploit their immune status (N= 24 of 33 Immune

Punishers and 28 of 39 Sole Punishers, due to technical problems 13 immune individuals were not classified).

However, we still found the same qualitative pattern of results, with immune Conditional Cooperators declining significantly faster than their groupmates (Immune Punisher scenario: $N = 24$ immune Conditional Cooperators & 126 non-immune individuals; glmer: $\text{round} \times \text{immunity} = -0.23 \pm 0.042$, z value = -5.58 , $P < 0.001$; Sole Punisher scenario: $N = 28$ immune Conditional Cooperators & 96 non-immune individuals; glmer: $\text{round} \times \text{immunity} = -0.23 \pm 0.038$, z value = -6.17 , $P < 0.001$). By the final round of the Immune Punisher scenario, the immune Conditional Cooperators had a median contribution of 1 MU despite their groupmates having a median contribution of 7 MU. These results confirm that even ‘Conditional Cooperators’ will stop following a stable, peer enforced, social norm (Immune Punisher scenario) if they themselves are immune from punishment (Figure 3). This is consistent with the confused learners hypothesis but contradicts the Altruistic-Punishment hypothesis.

Conditional cooperators learn to exploit their immunity

We next restricted all the data, both immune and non-immune individuals, to just ‘Conditional Cooperators’ (Supplementary Figures 3 & 4). This allowed us to directly compare how Conditional Cooperators behaved, from start to finish, depending on whether they were immune or not. First, we found that Conditional Cooperators started contributing at near identical levels, regardless of if they were immune or not, within both the Immune Punisher scenario (41%, median of 8 MU) and the Sole Punisher scenario (48-50%, median of 10 MU). This is consistent with individuals initially contributing even in experiments without punishment. However, as reported above, the immune Conditional Cooperators subsequently learned to exploit their immunity and contribute less. Specifically, in the Sole Punisher scenario, non-immune Conditional Cooperators decreased from 48% to 28% (from a median of 10 to 5 MU), whereas immune Conditional Cooperators decreased significantly more, from 50% to 16% (median from 10 to 0 MU) ($N = 28$ immune Conditional Cooperators & 96 non-immune individuals; glmer: $\text{round} \times \text{immunity} = -0.36 \pm 0.039$, z value = -6.81 , $P < 0.001$, Supplementary Figures 3 & 4).

The difference was even more stark in the Immune Punisher scenario, where non-immune Conditional Cooperators, always under the threat of punishment from multiple groupmates,

displayed a near stable social norm, only decreasing slightly, from 41% to 36% (from a median of 8 to 7.5 MU). In contrast, the immune Conditional Cooperators, despite apparently having the same preference for fair and equal outcomes, and the same starting level, showed a significantly greater decline, from 41% to 23% (from a median of 8 to 1 MU) ($N = 24$ immune Conditional Cooperators & 72 non-immune individuals; $\text{glmer: round*immunity} = -0.25 \pm 0.043$, z value = -5.69, $P < 0.001$) (Supplementary Figures 3 & 4). Our results confirm that Conditional Cooperators, just like Free Riders, will take advantage of their immunity, once they have learned how to play the game. Crucially, our experiment design means this decline among Conditional Cooperators can no longer be attributed to a frustration at the lack of opportunities to discipline Free Riders or an attempt to match a declining social norm.

Instead, the decline among immune Conditional Cooperators is consistent with the Confused Learners hypothesis. To test for the possibility of confusion, we had all individuals also complete a second strategy method before the game, but with computerized groupmates instead of humans^{36,43}. The procedure was identical except that each individual was knowingly grouped with three computerized virtual groupmembers that chose their contribution randomly. The income maximizing decision was to contribute 0 MU. However, we found that 85% of individuals still contributed more than 0 MU when grouped with computers, indicating substantial ‘confusion’ among our participants ($N = 339$ of 399; due to technical problems 21 individuals were not classified).

Punishment was common, frequent, and destructive

After everyone had made their decisions, individuals learned what the contributions and earnings were of all four group members. They then could pay to deduct MU from their groupmates’ earnings (to ‘punish’, note, the instructions referred to ‘deductions’ and never ‘punishment’). It cost 1 MU to deduct 3 MU from one individual, and the most an individual could spend on punishing another individual was 10 MU (leading to a loss of 30 MU for the punished individual). To prevent income disparities from the contribution round limiting an individual’s ability to punish or be punished, we endowed all individuals with an extra 30 MU that they could either keep or spend partially/fully on ‘punishing’ others. After the punishment decisions had been made, the individuals learned how many MU had been deducted from their account, i.e., how much they had been punished, but they did not know which individual(s) had punished them. All individuals were anonymous, and no repeated interactions could occur, which meant that punishing was a costly act that could not possibly

benefit the punisher. Therefore, a population of fully rational, self-interested, individuals would neither contribute nor punish at any point in this experiment.

Punishment was common, with 76% of eligible individuals choosing to punish at least once (N = 220 of 291 individuals that could punish), and 23% of eligible individuals choosing to punish in all five rounds (N = 66). In the Mutual Punishers scenario, which replicated the original design to test for altruistic punishment, we found that individuals punished at least one of their three groupmates 59% of the time (N=237/400 instances) and in 14% of occasions, an individual chose to punish all three of their groupmates (N = 55 instances, Supplementary Table 1). Of the 80 individuals, 63 (79%) chose to punish at least once, and 21 (26%) chose to punish in every round (Supplementary Table 2), consistent with the original results where 84% of individuals punished at least once ⁶. The mean average spending on punishment per round was 3.2 MU, 95% bootstrapped Confidence Interval = 2.74, 3.67 MU, resulting in a mean deduction of 9.6 MU and an overall average cost of 12.8 MU per individual per round (Supplementary Figure 5).

Consequently, the additional collective earnings produced from the stable contributions in the Mutual-Punishers scenario, of +5.2 MU, 95% bootstrapped Confidence Interval = 4.86, 5.54 MU, per individual per round, were more than entirely wiped out by the collective costs of punishing (-12.8 MU per individual per round), leading to a net loss on average (total endowment across 5 rounds = 250 MU, mean final earnings = 215.2 MU, 95% bootstrapped Confidence Intervals = 210.2, 220.0 MU). Average earnings would have been around 16% higher among a population of perfectly selfish individuals, who not only never punished, but also never even contributed (Supplementary Figure 5). Even if every individual had contributed fully (20/20 MU) in one round, something not achieved by any of the 100 groups formed in this scenario (the highest group contribution achieved was 79%, 63 of 80 MU), the collective cost of this much punishment (-12.8 MU per round) would still have outweighed the collective benefit of contributing fully (+12 MU per round).

Immune individuals punished less and earned more

When groups contained many individuals capable of punishing, the immune individuals punished less (Figure 4). In the Immune Punisher scenario, 64% of immune individuals (N=27/42), and 77% of the non-immune individuals (N=97/126), punished at least once. The mean average amount non-immune individuals spent on punishing per round was 2.4 MU,

95% bootstrapped Confidence Interval = 2.13, 2.74 MU. In contrast, the immune punishers, who could not be motivated by a misplaced sense of ‘blind revenge’ or pre-emptive strikes against those they anticipated would punish them ⁵, spent only half as much on punishment, at 1.2 MU, 95% bootstrapped Confidence Interval = 0.94, 1.56 MU, significantly less than the non-immune individuals (glmer controlling for individual and session and round of the game: immune estimate = -0.86 ± 0.328 , z value = -2.62, P = 0.009). This was true even though immune individuals could punish more targets (three instead of just two). This meant that their per target spending on punishment was considerably lower, at just 0.4 MU instead of 1.2 MU. The per target punishing by the non-immune punishers was consistent with the 1.1 MU spent per potential target in the Mutual Punishers scenario (Likelihood ratio test: $\chi^2 = 0.5$, df = 1, P = 0.469, N = 206 individuals). In every round of the Immune Punisher scenario, most of the immune individuals chose not to punish any of their three groupmates, whereas most non-immune individuals did choose to punish one of their two vulnerable groupmates (Supplementary Table 3; Supplementary Figure 6).

Consequently, the immune punishers earned a profit on average (total endowment = 250 MU, mean final earnings = 275.5 MU, bootstrapped 95% Confidence Interval = 269.8, 281.1 MU) and significantly more than the non-immune individuals (likelihood ratio test: $\chi^2 = 132.7$, df = 2, P < 0.001, N = 168 individuals), who made a loss on average (mean final earnings = 217.3 MU, 95% bootstrapped Confidence Interval = 212.4, 221.7 MU) due to spending more on punishing and also being punished (Supplementary Figure 5).

In the Sole Punisher scenario, the immune individuals were the only ones that could punish, and thus they could not free-ride on the punishing behaviors of other individuals. Here, 77% of the Sole Punishers punished at least once (N = 33/43), and their mean average spending on punishment was 2.7 MU, 95% bootstrapped Confidence Interval = 2.16, 3.34 MU. However, despite the apparent difference, it is not clear if this was more than the spending of 1.2 MU by immune individuals in the Immune Punisher scenario (although the bootstrapped confidence intervals did not overlap, the glmer statistical model was marginally non-significant: scenario estimate = 0.83 ± 0.459 , z value = 1.81, P = 0.071). Both the immune and non-immune individuals made a mean average profit on their total endowment of 250 MU in the Sole Punisher scenario, as is normal in public goods games without punishment (immune final earnings = 264.4 MU, 95% bootstrapped Confidence Interval = 256.1, 272.5

MU; non-immune final earnings = 253.1 MU, 95% bootstrapped Confidence Interval = 249.9, 256.0 MU). However, the immune individuals made significantly more on average (Likelihood ratio test: $\chi^2 = 13.9$, $df = 1$, $P < 0.001$, $N = 172$ individuals) (Supplementary Figure 5).

The frequency of punishment decreased among immune individuals

There was a significant difference in how the frequency of punishers changed over time depending on immunity (Supplementary Figure 6). Whereas the frequency of non-immune punishers was relatively constant (Immune Punisher scenario, non-immune punishers started and finished at 52%, $N = 65$ and $66/126$ respectively), or even increased (Mutual Punishers scenario increased from 53% to 60%, $N = 42$ and $48/80$ respectively); the frequency of immune punishers generally decreased (Immune Punisher scenario, from 45% to 36%, $N = 19$ and $15/42$ respectively; Sole Punisher scenario, from 58% to 47%, $N = 25$ and $20/43$ respectively). Analysing all the data together, excluding those individuals not allowed to punish ($N = 129$), we found a significant interaction between round of the game and immunity status, with a negative coefficient for immune individuals (glmer: logistic regression, controlling for individual: $\text{round} \times \text{immunity} = -0.25 \pm 0.107$, z value = -2.31 , $P = 0.021$, $N = 291$ individuals). Analysing just the immune individuals, and controlling for scenario, we find a significant decline in the frequency of punishers (glmer: $\text{round} = -0.25 \pm 0.103$, z value = -2.44 , $P = 0.015$, $N = 85$ individuals).

Comparing ‘social’ and ‘anti-social’ punishment

Previous laboratory experiments have documented varying ratios of ‘social’ and ‘anti-social’ punishment across different societies. Social punishment is the altruistic punishment of the lowest contributor(s), and anti-social punishment is basically the opposite, the punishment of the highest contributor(s)^{44,45}. Social punishment is generally thought to dominate, especially in societies such as Switzerland, with a strong sense of trust in the law¹⁹.

In line with previous research, we found in our Swiss participant pool that among non-immune individuals, most of the punishment behaviors were ‘social’, and therefore appeared consistent with the Altruistic Punishment hypothesis. We defined punishment behaviors according to how an individual acted towards all of their groupmates in a particular round. If an individual only punished lower contributors, then this was ‘social’ punishment; otherwise,

it was ‘anti-social’ punishment (or no punishment) (Figure 5). Specifically, we found that 79% of punishment behaviors in the Mutual Punishers scenario (N=188/273), and 66% of punishment behaviors among the non-immune individuals in the Immune Punisher scenario (N=219/331), could be classified as ‘social’ (exclusively against lower contributors than the punisher) (Table 1).

However, among immune individuals, the instances of social punishment were drastically lower, at just 49% in the Immune Punisher scenario (N=38/77), and 54.5% in the Sole Punisher scenario (N=60/110) (Fisher’s Exact Test on counts of social punishment among immune and non-immune individuals combined: $P < 0.0001$, Table 1). Overall, this meant that among immune individuals, the ratio of ‘social’ to ‘anti-social’ punishment was approximately 1:1, invalidating the view that humans can generally be described as altruistic or ‘social’ punishers (N = 98:89, binomial sign test, two-tailed P value = 0.559).

We next measured how many individuals were consistent in their use of punishment across the five rounds. Analysing each and every individual’s behavior across all five rounds, we found that among all punishers, both immune and non-immune, only 52% restricted themselves to just social punishment throughout the experiment (N = 114 of 220 individuals that punished) (Table 2). Therefore, among individuals that punished, 48% performed at least some anti-social punishment at some point in the experiment. These results further invalidate the view that humans can generally be described as altruistic or ‘social’ punishers.

Punishment was often hypocritical

What could explain the high levels of anti-social punishment, particularly among immune individuals? Anti-social punishment is often thought to be due to a sense of ‘revenge’, or preemptive strikes by low contributors against those they anticipate will punish them, however our experiment design ruled out these factors for our immune individuals. They were also from the same participant pool so their increased level of anti-social punishment cannot be due to systematic cultural differences either.

We were however able to explain this high level of ‘anti-social’ punishment among immune individuals as actually being ‘hypocritical’ (Figure 5). That is, the anti-social punishment of immune individuals was most often directed towards intermediate individuals, individuals that had contributed more than them, but less than the top contributor. This is not consistent

with either altruistic or anti-social punishment. Altruistic punishment requires punishing the lowest contributor(s), and anti-social punishment requires punishing the highest contributor(s). Instead, we found that approximately 1/3rd of punishment behaviors, 34% in the Immune Punisher scenario (N = 26 of 77 behaviors) and 34.5% in the Sole Punisher scenario (N = 38 of 110 behaviors), involved punishing higher, but intermediate, contributors, and not the top contributor (Table 1). This provides a conservative estimate of the levels of hypocritical punishment. Taken alone, this punishment behavior is consistent with pro-social motives, however when combined with a lower contribution, the overall trait becomes hypocritical, and communicates the message, ‘do as I say, not as I do’. This challenges the view that contributions and punishment together form an altruistically motivated linked trait.

DISCUSSION

We found that costly punishment was common, frequent, and destructive, and we replicated the original findings that costly punishment can sustain cooperation when everyone is able to punish and be punished (“Mutual Punishers” scenario, Figures 1,2). However, when we made one individual permanently immune to the threat of punishment, they learned to contribute significantly less, despite being surrounded by a high level of cooperation (Figure 2). This was even true for those that individuals who had been classified as Conditional Cooperators at the start of the experiment (Supplementary Figures 3 & 4). Immune individuals also punished less (Figure 4; Supplementary Figure 6), and often punished anti-socially or hypocritically, that is, they punished individuals that had contributed more than them (Figure 5, Tables 1 and 2). We found that altruistic and non-altruistic punishment (social and anti-social punishment) appeared almost equally common, with 48% of all immune punishing behaviors being non-social (Table 1), and 48% of all punishers, across all scenarios, punishing non-socially at some point (Table 2).

Previous studies had concluded that humans were mostly altruistic punishers, who liked to match the cooperation of others (‘Conditional Cooperators’) and to punish non-cooperators (‘Free Riders’) (‘Altruistic Punishment’ / ‘Strong Reciprocity’ hypothesis). However, these results show that these conclusions were based on experiments that confounded a fear of punishment with being surrounded by high contributors (cooperators). When an individual is free to contribute and punish as they want, they often become low contributors who punish hypocritically⁴⁰. Punishing hypocritically increases rather than decreases inequity between

individuals, challenging explanations based on inequity aversion ⁴⁶⁻⁵⁰. These results contradict the Altruistic Punishment / Strong Reciprocity hypothesis and support the hypothesis that many individuals are initially confused in experiments but learn from experience to contribute less. This finding is supported by our finding that 85% of our participants also cooperated with computerized groupmates.

The fact that low contributors, especially when immune, chose to punish higher, but still relatively low, contributors shows that Free Riders will not ‘free ride’ on punishment and that individuals can appear to have inconsistent behaviors ¹⁸. An interpretation reinforced by our finding that many punishers, 35%, were inconsistent in their use of punishment across all five rounds, choosing to punish both socially and anti-socially at different times (Table 2). These results suggest that cooperation and punishment are not linked traits, as often assumed, and that immune individuals were punishing out of a sense of hypocrisy, competitiveness, or confusion ^{22,51-53}. Individuals may have thought they could somehow gain from the punishment, either directly, or indirectly, via a chain of interactions. Immune individuals significantly decreased their frequency of punishment over time, albeit it slightly (Supplementary Figure 6), suggesting that individuals may learn not to punish if the game were long enough. However, this is a logistical challenge in the perfect-stranger design. Longer experiments with repeated interactions are more feasible, but they are not applicable because their design tends to favor punishment ⁵⁴.

Evolutionary explanations for human cooperation relying on altruistic punishment also suffer from other findings. Specifically, the fact that that punishment tends to erode any collective gains from cooperation in such experiments, a result we replicated here (Supplementary Figure 5), challenges the idea that altruistic punishment could be favored by group selection ⁵⁵. Some evolutionary models work on the assumption that punishment will be rare when altruistic punishers are common, and thus altruistic punishers will not be at a large disadvantage ¹⁵. However, our results and other experiments show that the laboratory behaviors taken as evidence for altruistic punishment in cooperative societies are common and easily triggered. Other models do not require group extinctions but have assumed that cooperation and punishment are linked, and that a phenotype which punishes but does not cooperate simply cannot exist ¹⁷. But this is an unfounded assumption, contradicted by our results, and there would be strong selection pressure to decouple these traits, which would lead to the erosion of cooperation ^{56,57}. There is also little ethnographic evidence for altruistic

punishment^{25,26,58-60}. Finally, the explanation is also undermined by the costs of retaliation ('counter punishment') or feuds, which are artificially prevented in the classical design, but further erode the collective benefits of punishment^{38,60-66}.

Our study, like all studies, has some limitations. We only tested students based in Switzerland, so have to be wary of over-generalizing⁶⁷. However, the original findings of altruistic punishment also used students in Switzerland⁶, and studies of anti-social punishment recorded very low levels of anti-social punishment in Switzerland⁴⁴. Two sets of results that we contradict here using a similar participant pool. Punishment was also anonymous in our experiment, and individuals only knew how much they had been punished, not by whom or by how many individuals, but this is standard procedure in punishment experiments^{5,6,19}. Allowing individuals more targeted interactions may be more realistic and may affect the results^{38,68,69}.

In conclusion, it would appear that in our sample, altruistic and non-altruistic punishment (social and anti-social punishment) appear almost equally common (Table 2). Therefore, future studies should stop viewing humans as altruistic punishers, which is likely to be a laboratory artefact, and no longer include a strong focus on altruistic punishment in explanations for human cooperation.

METHODS

Data collection

We collected the data in the autumn semester of 2019, from 21st October to 1st November. All data were anonymous and collected electronically. All our experimental files, data and analysis files are freely available online⁷⁰.

Participants and Location

We conducted all twenty sessions at the Faculty of Business and Economics (HEC), University of Lausanne (UNIL), Switzerland, in the HEC-LABEX facility. LABEX forbids deceiving participants and requires that all experimental designs obtain ethical approval from the LABEX ethics committee. We recruited our participants from the HEC-LABEX participant pool using ORSEE and excluded all participants from previous experiments by the same authors⁷¹. Participants were mostly students enrolled at either UNIL or the Swiss

Federal Polytechnic School (EPFL), and they can be from diverse ethnic, socio-economic and cultural backgrounds (these variables were not recorded). According to the questionnaires we had a near equal gender ratio (202 Female, 215 Male, 2 Other, and 1 declined to answer) and the majority of our participants were under 26 years of age (134 aged under 20, 257 aged 20-25, 23 aged 26-30, 2 aged 30-35, 3 x Over 35, and 1 declined to answer, responses to the age question were categorical to increase anonymity).

Financial incentives

We paid all participants a show up fee of 10 CHF. In total, for most of the sessions we endowed each participant with 290 Monetary Units (MU) and each MU was worth 0.04 CHF, so 20 MU was worth 0.8 CHF and the endowment was worth 11.60 CHF. The exceptions were that in the first three sessions, the exchange rate was 1 MU = 0.05 CHF, and in the first two sessions individuals had a smaller budget to spend on punishment (18 MU instead of 30 MU per round, so the total endowment = 230 MU, worth 11.50 CHF).

All earnings were rounded up to the nearest CHF, and the mean average payment was 22.60 CHF (this includes the 10 CHF show up fee), and ranged from 18 CHF to 31 CHF, with a median and a mode of 22 CHF.

Experiment procedure

A copy of all the experimental files are freely available online⁷⁰. Screen shots from the experiment, and an English copy of the key instructions, are available in the supplementary information.

Upon arrival, participants completed a paper consent form outlining who was funding and conducting the study, that they had already earned their show up fee and what the minimum and maximum possible additional earnings were. The form also told them that they were free to leave at any time although if they did not finish the experiment then they would only receive the show up fee. No participants chose to leave during the experiment. The rest of the experiment was then conducted entirely in z-Tree ⁷².

First, we introduced participants to the general dilemma. We gave them instructions describing the decision in the public good game, followed by four multi-part questions that involved calculating hypothetical payoffs for different scenarios. These instructions and

hypothetical questions had been copied, and translated into French, from those that have been made publicly available in a prior study⁹. There was a calculator available, and a help box at the bottom of the screen which contained a copy of the instructions. For each of the four multi-part questions, if the participant answered incorrectly, we made them try again, before automatically showing all participants the correct answers. We maintained the same parameters of the public goods game as in the original instructions, with groups comprising four participants each endowed with 20 MU and a marginal per capita return (MPCR) of 0.4.

We then made participants complete the ‘Strategy Method’, which asks participants to make a separate decision for each and every possible scenario of mean contributions by their three groupmates. Again, the instructions and presentation were copied from⁹. This allowed us to categorize individuals into different social types before they played the main game. However, we also had them make the same decisions but for a special case where they were in a group with three computer individuals. We told them that the computer would make a random decision from 0 to 20, for each of their virtual group members, and that the participant was the only person who would be affected by these decisions. This allowed us to measure confusion in participants^{36,43}.

Experiment design

After we had explained the essential dilemma, and measured participants’ social preferences, we conducted the core of the experiment. Participants knowingly play a repeated version of the same public goods game ($N=4$, $MPCR = 0.4$), for five rounds. They were told that the group composition would change after each round, in such a way that ensured that no two individuals ever interacted twice (perfect stranger matching,^{5,6}). We utilized three different scenarios, each with either one or two distinct player roles, that were held constant for the duration of the game (Figure 1). All participants in the same session faced the same scenario. The five rounds of the game therefore represent five ‘one-shot’ versions of the scenario, played with different people each time, and all roles held constant.

In each scenario, there were two decision phases per round of the game, that followed the original design for ‘altruistic punishment’⁶. In decision-phase one, individuals made a simultaneous contribution to the public good, ranging from 0-20 MU. Contributions were multiplied by 1.6 and shared out equally to all four group members. Then, for decision-phase two, all the individuals were informed of the individual contributions and payoffs of each of

their groupmates (we showed their groupmates contributions in random order on the screen). They could then, depending on their assigned role, choose to pay to deduct earnings from their groupmates ('to punish'). The cost of punishment was 1 MU to deduct 3 MU. Individuals could spend up to 10 MU (6 MU in sessions 1 and 2) per person they punished. To make punishment equally affordable to all eligible punishers, each individual was endowed with a punishment budget of 30 MU (18 MU in sessions 1 and 2). The most a victim of punishment ('punishee') could lose was their total earnings from the contributions stage (maximum 44 MU), which meant no individuals could ever earn a negative amount from a specific round of the game.

Our primary modification is to introduce individuals that cannot be punished, instead they are 'immune' to punishment. In the classical design, all individuals could punish all other individuals⁶. We replicate this design in our baseline scenario for comparison, and name it the 'Mutual-Punishers' scenario. In contrast, for our other two scenarios, we introduced one immune individual to each group.

In our 'Immune-Punisher' scenario, one individual, the 'immune-punisher', is immune to punishment, but can still punish all the other individuals, who are not immune, and thus are like 'mutual-punishers'. Thus, the immune punisher can punish up to three groupmates, whereas the non-immune punishers in this scenario can only punish up to two groupmates. In our 'Sole-Punisher' scenario, only one individual, the 'sole-punisher', can punish, and he/she can punish all the other individuals, who are not immune. In this scenario, the 'sole-punisher' is in effect immune because there is no one else who has the power to punish him/her. The key treatment design in our experiment is whether an individual is randomly assigned to be immune or not immune, within three different background scenarios/ecologies.

The instructions gave individuals full knowledge, in theory, of their scenario, of the distribution of player roles and that the roles were constant for the duration of the game (5 rounds). The game was 5 rounds long because this was the maximum number of rounds compatible with a perfect-stranger grouping mechanism and 20 participants. After the instructions for the punishment game, the participants had to calculate the answers for a brief quiz comprising six questions (adapted from¹⁹). We then showed all participants the correct answers (Supplementary Materials). When an individual was asked to make their punishment entries, the row corresponding to any immune individuals did not have an empty input box,

instead they saw a message that said deductions of this individual's income were not possible. Individuals that were unable to make punishments on anyone still saw all the same information, but saw a message telling them that 'You cannot make deductions.'

Classifying punishment behaviors

We first classified the potential acts of punishment between two individuals (Figure 5). Specifically, the potential acts of punishment were classified as: If the victim contributed less than the focal individual, then this was an act of social punishment. If the victim was the top or joint top contributor, and had contributed more than the focal individual, then this was an act of anti-social punishment. If the victim contributed either: the same as the focal individual, regardless of amount; or contributed more than the focal individual, but less than the top contributor, then this was an act of hypocritical punishment.

Although these three classifications may seem straightforward, most of the time an individual who punished chose to punish more than one individual (53% of all instances of punishing involved an individual punishing more than one individual ($N = 399/755$), which was 27% of all possible instances ($N=1,455$) (Supplementary Table 1). We therefore classified each individual's overall punishment behavior per round according to their full profile of punishment acts in that round.

If the focal individual only punished socially, this was a round of 'social punishment'. If the focal individual punished anti-socially, but not socially, this was a round of 'anti-social punishment'. If the focal individual punished hypocritically, but not anti-socially, this was 'hypocritical punishment' (Figure 5). If the profile did not match any of these three classifications then the behavior was 'other'.

We then classified punishers according to how they were classified across all five rounds. If their punishment behavior was only ever classified as 'social' then they were an 'only social' punisher; if their behavior was only ever classified as 'anti-social' or 'hypocritical' or 'other', then they were a 'never social' punisher. If their behavior was sometimes social and sometimes non-social, then they were 'both' (Table 2).

Statistical analyses

We analysed the data using R-Studio ⁷³. All statistical tests were two-tailed and the analysis code files are freely available online⁷⁰.

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REFERENCES

- 1 Ledyard, J. in *Handbook of Experimental Economics* (eds J. H. Kagel & A. E. Roth) 253-279 (Princeton University Press, 1995).
- 2 Zelmer, J. Linear public goods experiments: a meta-analysis. *Exp Econ* **6**, 299-310 (2003).
- 3 Chaudhuri, A. Sustaining cooperation in laboratory public goods experiments: a selective survey of the literature. *Exp Econ* **14**, 47-83, doi:10.1007/s10683-010-9257-1 (2011).
- 4 Burton-Chellew, M. N. & West, S. A. Payoff-based learning best explains the rate of decline in cooperation across 237 public-goods games. *Nat Hum Behav* **In Press** (2021).
- 5 Fehr, E. & Gächter, S. Cooperation and punishment in public goods experiments. *Am Econ Rev* **90**, 980-994 (2000).
- 6 Fehr, E. & Gächter, S. Altruistic punishment in humans. *Nature* **415**, 137-140 (2002).
- 7 Fischbacher, U., Gächter, S. & Fehr, E. Are people conditionally cooperative? Evidence from a public goods experiment. *Econ Lett* **71**, 397-404 (2001).
- 8 Fehr, E. & Fischbacher, U. The nature of human altruism. *Nature* **425**, 785-791 (2003).
- 9 Fischbacher, U. & Gächter, S. Social Preferences, Beliefs, and the Dynamics of Free Riding in Public Goods Experiments. *Am Econ Rev* **100**, 541-556, doi:10.1257/aer.100.1.541 (2010).
- 10 Fehr, E. & Schurtenberger, I. Normative foundations of human cooperation. *Nat Hum Behav* **2**, 458-468, doi:<https://doi.org/10.1038/s41562-018-0385-5> (2018).
- 11 Bowles, S. & Gintis, H. Behavioral science - Homo reciprocans. *Nature* **415**, 125-128 (2002).
- 12 Bowles, S. & Hwang, S. H. Social preferences and public economics: Mechanism design when social preferences depend on incentives. *J Public Econ* **92**, 1811-1820, doi:10.1016/J.jpubeco.2008.03.006 (2008).
- 13 Paál, T. in *Encyclopedia of Evolutionary Psychological Science* (eds Todd K. Shackelford & Viviana A. Weekes-Shackelford) 1-3 (Springer International Publishing, 2017).
- 14 Fehr, E., Fischbacher, U. & Gächter, S. Strong reciprocity, human cooperation, and the enforcement of social norms. *Hum Nature-Int Bios* **13**, 1-25 (2002).

674 15 Boyd, R., Gintis, H., Bowles, S. & Richerson, P. J. The evolution of altruistic
675 punishment. *P Natl Acad Sci USA* **100**, 3531-3535 (2003).

676 16 Gintis, H., Bowles, S., Boyd, R. & Fehr, E. Explaining altruistic behavior in humans.
677 *Evol Hum Behav* **24**, 153-172 (2003).

678 17 Bowles, S. & Gintis, H. The evolution of strong reciprocity: cooperation in
679 heterogeneous populations. *Theor Popul Biol* **65**, 17-28 (2004).

680 18 Weber, T. O., Weisel, O. & Gächter, S. Dispositional free riders do not free ride on
681 punishment. *Nat Commun* **9**, 2390, doi:10.1038/s41467-018-04775-8 (2018).

682 19 Herrmann, B., Thoni, C. & Gächter, S. Antisocial punishment across societies.
683 *Science* **319**, 1362-1367, doi:10.1126/Science.1153808 (2008).

684 20 Fowler, J. H. Altruistic punishment and the origin of cooperation. *P Natl Acad Sci*
685 *USA* **102**, 7047-7049 (2005).

686 21 Barclay, P. Reputational benefits for altruistic punishment. *Evol Hum Behav* **27**, 325-
687 344, doi:10.1016/J.Evolhumbehav.2006.01.003 (2006).

688 22 Jensen, K. Punishment and spite, the dark side of cooperation. *Philos T R Soc B* **365**,
689 2635-2650, doi:10.1098/rstb.2010.0146 (2010).

690 23 Pedersen, E. J., Kurzban, R. & McCullough, M. E. Do humans really punish
691 altruistically? A closer look. *Proceedings of the Royal Society B-Biological Sciences*
692 **280**, doi:10.1098/Rspb.2012.2723 (2013).

693 24 Raihani, N. J. & Bshary, R. The reputation of punishers. *Trends in Ecology &*
694 *Evolution* **30**, 98-103, doi:10.1016/j.tree.2014.12.003 (2015).

695 25 Pedersen, E. J., McAuliffe, W. H. B. & McCullough, M. E. The Unresponsive
696 Avenger: More Evidence That Disinterested Third Parties Do Not Punish
697 Altruistically. *J Exp Psychol Gen* **147**, 514-544, doi:10.1037/xge0000410 (2018).

698 26 Pedersen, E. J. *et al.* When and Why Do Third Parties Punish Outside of the Lab? A
699 Cross-Cultural Recall Study. *Soc Psychol Pers Sci* **11**, 846-853, doi:Artn
700 1948550619884565
701 10.1177/1948550619884565 (2020).

702 27 Andreoni, J. Cooperation in public-goods experiments - kindness or confusion. *Am*
703 *Econ Rev* **85**, 891-904 (1995).

704 28 Palfrey, T. R. & Prisbrey, J. E. Altruism, reputation and noise in linear public goods
705 experiments. *J Public Econ* **61**, 409-427, doi:10.1016/0047-2727(95)01544-2
706 (1996).

707 29 Palfrey, T. R. & Prisbrey, J. E. Anomalous behavior in public goods experiments:
708 How much and why? *Am Econ Rev* **87**, 829-846 (1997).

709 30 Houser, D. & Kurzban, R. Revisiting kindness and confusion in public goods
710 experiments. *Am Econ Rev* **92**, 1062-1069 (2002).

711 31 Cooper, D. J. & Stockman, C. K. Fairness and learning: an experimental examination.
712 *Games and Economic Behavior* **41**, 26-45 (2002).

713 32 Janssen, M. A. & Ahn, T. K. Learning, signaling, and social preferences in public-
714 good games. *Ecol Soc* **11** (2006).

715 33 Arifovic, J. & Ledyard, J. Individual evolutionary learning, other-regarding
716 preferences, and the voluntary contributions mechanism. *J Public Econ* **96**, 808-823,
717 doi:10.1016/J.Jpubeco.2012.05.013 (2012).

718 34 Burton-Chellew, M. N. & West, S. A. Prosocial preferences do not explain human
719 cooperation in public-goods games. *P Natl Acad Sci USA* **110**, 216-221, doi:10.1073/Pnas.1210960110 (2013).

720
721 35 Burton-Chellew, M. N., Nax, H. H. & West, S. A. Payoff-based learning explains the
722 decline in cooperation in public goods games. *Proceedings of the Royal Society B-*
723 *Biological Sciences* **282**, doi:Artn 20142678

10.1098/Rspb.2014.2678 (2015).

36 Burton-Chellow, M. N., El Mouden, C. & West, S. A. Conditional cooperation and confusion in public-goods experiments. *P Natl Acad Sci USA* **113**, 1291-1296, doi:10.1073/pnas.1509740113 (2016).

37 Andreozzi, L., Ploner, M. & Saral, A. S. The stability of conditional cooperation: beliefs alone cannot explain the decline of cooperation in social dilemmas. *Sci Rep-Uk* **10**, 13610, doi:10.1038/s41598-020-70681-z (2020).

38 Gordon, D. S. & Puurtinen, M. High cooperation and welfare despite-and because of-the threat of antisocial punishments and feuds. *J Exp Psychol Gen*, doi:10.1037/xge0001004 (2020).

39 O'gorman, R., Henrich, J. & Van Vugt, M. Constraining free riding in public goods games: designated solitary punishers can sustain human cooperation. *Proceedings of the Royal Society B-Biological Sciences* **276**, 323-329, doi:Doi 10.1098/Rspb.2008.1082 (2009).

40 Hoeft, L. & Mill, W. An experimental investigation of designated punishment behavior in public goods. *Econ Lett* **157**, 41-44 (2017).

41 Grieco, D., Faillo, M. & Zarri, L. Enforcing cooperation in public goods games: Is one punisher enough? *J Econ Psychol* **61**, 55-73 (2017).

42 Thoni, C. & Volk, S. Conditional cooperation: Review and refinement. *Economic Letters* **171**, 37-40 (2018).

43 Ferraro, P. J. & Vossler, C. A. The Source and Significance of Confusion in Public Goods Experiments. *Be J Econ Anal Poli* **10** (2010).

44 Gächter, S., Herrmann, B. & Thoni, C. Antisocial punishment across societies. *Science* **319**, 1362-1367, doi:10.1126/science.1153808 (2008).

45 Pleasant, A. & Barclay, P. Why Hate the Good Guy? Antisocial Punishment of High Cooperators Is Greater When People Compete To Be Chosen. *Psychol Sci* **29**, 868-876, doi:10.1177/0956797617752642 (2018).

46 Fehr, E. & Schmidt, K. M. A theory of fairness, competition, and cooperation. *Q J Econ* **114**, 817-868 (1999).

47 Fowler, J. H., Johnson, T. & Smirnov, O. Human behavior - Egalitarian motive and altruistic punishment. *Nature* **433**, -, doi:Doi 10.1038/Nature03256 (2005).

48 Dawes, C. T., Fowler, J. H., Johnson, T., McElreath, R. & Smirnov, O. Egalitarian motives in humans. *Nature* **446**, 794-796 (2007).

49 Raihani, N. J. & McAuliffe, K. Human punishment is motivated by inequity aversion, not a desire for reciprocity. *Biology Letters* **8**, 802-804 (2012).

50 Deutchman, P., Bracic, M., Raihani, N. & McAuliffe, K. Punishment is strongly motivated by revenge and weakly motivated by inequity aversion. *Evol Hum Behav* **42**, 12-20, doi:10.1016/j.evolhumbehav.2020.06.001 (2021).

51 Ubeda, F. & Duenez-Guzman, E. A. Power and Corruption. *Evolution* **65**, 1127-1139 (2011).

52 Roberts, G. When Punishment Pays. *PLoS ONE* **8** (2013).

53 Paal, T. & Bereczkei, T. Punishment as a Means of Competition: Implications for Strong Reciprocity Theory. *PLoS ONE* **10** (2015).

54 Gächter, S., Renner, E. & Sefton, M. The Long-Run Benefits of Punishment. *Science* **322**, 1510-1510, doi:Doi 10.1126/Science.1164744 (2008).

55 Egas, M. & Riedl, A. The economics of altruistic punishment and the maintenance of cooperation. *Proceedings of the Royal Society B-Biological Sciences* **275**, 871-878, doi:Doi 10.1098/Rspb.2007.1558 (2008).

772 56 Lehmann, L., Rousset, F., Roze, D. & Keller, L. Strong reciprocity or strong ferocity?
 773 A population genetic view of the evolution of altruistic punishment. *Am Nat* **170**, 21-
 774 36 (2007).
 775 57 Rand, D. G. & Nowak, M. A. The evolution of antisocial punishment in optional
 776 public goods games. *Nat Commun* **2** (2011).
 777 58 Baumard, N. Has punishment played a role in the evolution of cooperation? A critical
 778 review. *Mind and Society* **9**, 171-192 (2010).
 779 59 Guala, F. Reciprocity: Weak or strong? What punishment experiments do (and do not)
 780 demonstrate. *Behav Brain Sci* **35** (2012).
 781 60 Molho, C., Tybur, J. M., Van Lange, P. A. M. & Balliet, D. Direct and indirect
 782 punishment of norm violations in daily life. *Nat Commun* **11**, doi:ARTN 3432
 783 10.1038/s41467-020-17286-2 (2020).
 784 61 Nikiforakis, N. Punishment and counter-punishment in public good games: Can we
 785 really govern ourselves? *J Public Econ* **92**, 91-112, doi:Doi
 786 10.1016/J.Jpubeco.2007.04.008 (2008).
 787 62 Denant-Boemont, L., Masclet, D. & Noussair, C. N. Punishment, counterpunishment
 788 and sanction enforcement in a social dilemma experiment. *Econ Theor* **33**, 145-167,
 789 doi:10.1007/s00199-007-0212-0 (2007).
 790 63 Nikiforakis, N. & Engelmann, D. Altruistic punishment and the threat of feuds. *J*
 791 *Econ Behav Organ* **78**, 319-332, doi:10.1016/j.jebo.2011.01.017 (2011).
 792 64 Fehl, K., Sommerfeld, R. D., Semmann, D., Krambeck, H. J. & Milinski, M. I Dare
 793 You to Punish Me-Vendettas in Games of Cooperation. *PLoS ONE* **7**, doi:ARTN
 794 e45093
 795 10.1371/journal.pone.0045093 (2012).
 796 65 Andrighetto, G. *et al.* Counter-Punishment, Communication, and Cooperation among
 797 Partners. *Front Behav Neurosci* **10** (2016).
 798 66 Balafoutas, L., Nikiforakis, N. & Rockenbach, B. Altruistic punishment does not
 799 increase with the severity of norm violations in the field. *Nat Commun* **7** (2016).
 800 67 Henrich, J. *et al.* Costly punishment across human societies. *Science* **312**, 1767-1770,
 801 doi:10.1126/science.1127333 (2006).
 802 68 Kiyonari, T. & Barclay, P. Cooperation in social dilemmas: Free riding may be
 803 thwarted by second-order reward rather than by punishment. *J Pers Soc Psychol* **95**,
 804 826-842, doi:DOI 10.1037/a0011381 (2008).
 805 69 Rand, D. G., Dreber, A., Ellingsen, T., Fudenberg, D. & Nowak, M. A. Positive
 806 Interactions Promote Public Cooperation. *Science* **325**, 1272-1275,
 807 doi:10.1126/science.1177418 (2009).
 808 70 Burton-Chellew, M. N. & Guérin, C. Supplementary Materials for Burton-Chellew &
 809 Guerin 2021: Decoupling Altruistic Punishment. *OSF*, doi:<https://osf.io/pdjqm/>
 810 (2021).
 811 71 Greiner, B. Subject pool recruitment procedures: organizing experiments with
 812 ORSEE. *J Econ Sci Assoc* **1**, 114-125, doi:10.1007/s40881-015-0004-4 (2015).
 813 72 Fischbacher, U. z-Tree: Zurich toolbox for ready-made economic experiments. *Exp*
 814 *Econ* **10**, 171-178, doi:Doi 10.1007/S10683-006-9159-4 (2007).
 815 73 Team, R. *RStudio: Integrated Development Environment for R*.
 816 (<http://www.rstudio.com>, 2020).
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821 **Figure 1: Experiment design.** We used three scenarios that varied in either the number of
 822 groupmembers allowed to punish others (holding a big club), or that were permanently
 823 immune to the threat of punishment (surrounded by blue sphere). The Mutual Punishers
 824 scenario replicated the original experiment design on altruistic punishment ⁶. The Immune
 825 Punisher scenario contained one groupmember that was immune to the threat of punishment
 826 but who could still punish groupmates. The Sole Punisher scenario contained only one
 827 groupmember that could punish groupmates, and thus this punisher was de facto immune.
 828 Individuals maintained their roles within each scenario for the duration of the experiment (5
 829 rounds). We changed the group composition accordingly each round to guarantee that no two
 830 individuals were ever in the same group more than once ('Perfect Stranger' mechanism ^{5,6}).
 831 All these features were common knowledge among participants within the same scenario.

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Figure 2: Immune individuals contribute less over time. Shown for each scenario are the mean (filled points), plus 95% bootstrapped confidence intervals, and the median (empty diamonds) contributions per individual per round, depending on player role (magenta = non-immune; blue = immune). Mutual Punishers, N = 80; Immune Punisher, immune, N = 42; non-immune, N = 126; Sole Punisher, immune = 43; non-immune = 129. Colored straight lines show, for the purposes of illustration only, linear regression estimates for each unique session*player role combination. Sessions were statistically modelled as random effects (N = 4 in Mutual Punishers; 8 in each of Immune Punisher and Sole Punisher scenarios). Immune individuals showed a greater decline in contributions than non-immune individuals in both the Immune Punisher scenario (glmer: round*immunity = -0.25 ± 0.036 , z value = -6.93, $P <$

846 0.001) and the Sole Punisher scenario (glmer: round*immunity = -0.23 ± 0.035 , z value = -
847 6.69, $P < 0.001$).
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Figure 3. Social preferences and the threat of punishment. The threat of punishment converts Free Riders (FR) into cooperators, but experience with immunity converts many Conditional Cooperators (CC) into Free Riders. Social preferences/type were measured before the game with the strategy method⁴². Data show the link between initial and final round contributions only. Thin lines are for each participant (solid points), and the thick lines show the mean contributions (empty points) plus 95% bootstrapped confidence intervals. Magenta = non-immune (can be punished), blue = immune from punishment. The figure combines individuals from both the Mutual Punishers and the Immune Punisher scenarios, where there was always a threat of punishment from three groupmates (or none). Sample sizes: Conditional Cooperators, non-immune = 126; immune = 24; Free Riders, non-immune = 24; immune = 5.

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865 **Figure 4. Immune individuals punish less.** Shown for each scenario are the mean (filled
866 points), plus 95% bootstrapped confidence intervals, and the median (empty diamonds) mean
867 spending per individual per round, depending on player role (magenta = non-immune; blue =
868 immune). Mutual Punishers, N = 80; Immune Punisher, immune, N = 42; non-immune, N =
869 126; Sole Punisher, immune = 43; non-immune = 129. Colored straight lines show, for the
870 purposes of illustration only, linear regression estimates for each unique session*player role
871 combination. Sessions were statistically modelled as random effects (N = 4 in Mutual
872 Punishers; 8 in each of Immune Punisher and Sole Punisher scenarios). In the Immune
873 Punisher scenario, immune individuals spent significantly less on punishment than non-
874 immune individuals (glmer: immune estimate = -0.86 ± 0.328 , z value = -2.62 , $P = 0.009$),

even though they could punish more groupmembers (three instead of just two for the non-immune).

Figure 5. Classifying punishment behaviors. We classified each punisher's behavior per round into one of three categories, or 'other'. Our figure shows the focal individual, with a halo, in the middle, holding a big club, with higher/lower contributors above/below her. If the focal individual: only punished one or more lower contributors then this was 'social punishment'; punished the top contributor, and did not punish any lower contributors, then this was 'anti-social' punishment; punished one or more equal or higher contributors, but did not punish the top contributor, then this was 'hypocritical' punishment. Green arrows, always on the left, with a club, show required punishment for that definition; red dotted arrows, always on the right, with a 'forbidden' sign, show forbidden punishment for that definition; grey dotted arrows, always on the left, show permissible but not necessary punishment for that definition. Dotted, semi-transparent, individuals may or may not have existed. Solid individuals were necessary. Individuals that had to be punished have an unhappy face.

Results are shown in Table 1.

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Table 1: Hypocrisy in public goods games. A classification of punishment behaviors per individual per round (see Figure 5) reveals substantial hypocrisy among individuals immune from punishment.

Scenario: immunity	Social	Anti-social	Hypocritical	Other	N obs.
Mutual Punishers: non-immune	79%	8%	8%	5%	237
Immune Punisher: non-immune	66%	14%	13%	6%	331
Immune Punisher: immune	49%	14%	34%	3%	77
Sole Punisher: immune	55%	9%	34.50%	2%	110
Total: non-immune	72%	11%	11%	6%	568
Total: immune	52%	11%	34%	2%	187

Social = the individual exclusively punished lower contributors.

Anti-social = the individual punished the highest contributor(s) and did not punish socially.

Hypocritical = the individual punished higher contributors, but not the highest contributor(s).

Other = the behavior was probably hypocritical, but did not match any of the above classifications, e.g. the individual punished lower contributors (social), and the highest contributor (anti-social).

Table 2: Punishment consistency. Classifying the overall punishing behavior of individuals across all five rounds.

Scenario: immunity	Social Only	Never Social	Both*	N individuals
Mutual Punishers: non-immune	62%	6%	32%	63
Immune Punisher: non-immune^	51%	7%	41%	97
Immune Punisher: immune	37%	33%	30%	27
Sole Punisher: immune	48%	24%	27%	33
Total: non-immune	55%	7%	38%	160
Total: immune	43%	28%	28%	60
Total	52%	13%	35%	220

*The individual was a social punisher in at least one round, and a non-social punisher in at least one round.

^one individual punisher was only ever classified as 'other', hence totals do not sum to 100%.

Supplementary Information for

Decoupling altruistic punishment: immune punishers learn to not cooperate, but still punish hypocritically.

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Contents:

Supplementary Methods

Supplementary Table 1. Number of punishment victims.

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Appendix. Screen shots of the experiment in French.

SUPPLEMENTARY METHODS.

Key instructions

The experiment was conducted in French, and screenshots of the experiment are available in the Appendix. Here we translate the instructions for the game with punishment into English. The participants had already been through the instructions for the contribution decision and the strategy method.

Screen 1.

“You are now going to take part in the final part of the experiment.

In this part, you will face the same decision scenario as outlined in the initial instructions.

As described, you will be in a group of 4 persons, you and 3 others. These are real people.

There will be 5 rounds of decision making. In each stage you will be grouped with new people.

You will **never** be grouped with the same person twice.

In each of the 5 rounds, you will be grouped with 3 new people, this applies to everyone in the experiment.

So, everyone will make 5 rounds of decision making in groups of 4. **But no two people will ever be in the same group.**

There are 20 (or maybe 24) people in the experiment. You will be grouped with 3 people 5 times, meaning you will interact with 15 different people.

In each round, there will be two stages of decision making, which we will now explain to you.

First, the 4 of you will make an unconditional decision as described in the initial instructions. This will be the end of the first stage.

Press continue to learn about the second stage.”

Screen 2.

“Stage 2: The Deduction Stage

Then in the second stage, you will see a screen detailing the decisions of each group member.

In this second stage, you can decrease the income of each other group member by assigning **deduction points** or by leaving the income **unchanged**. The other group members can also decrease your income if they wish to.

How it works - making deductions.

You will have to decide whether, and if so, how many deduction points to assign to **each** of the other three group members. In any case you must enter a number for each of them. If you do not wish to change the income of a specific group member then you must enter 0.

Every assigned deduction point costs you 1 MU. For example, if you assign 2 deduction points to one member, this costs you 2 MU; if, in addition, you assign 5 deduction points to another member this costs you 5 MU; and if you assign 0 points to the last group member this has no cost for you. In total, in this example, you would have assigned 7 points and your total costs therefore amount to 7 MU (2+5+0).

Each round, in the second stage, you will receive a **new endowment** of 30 MU.

You can use this to assign deduction points to group members.

The maximum deductions in total you can make in any one round is 30, and the maximum deduction you can make on one group member is 10.”

Screen 3.

“Stage 2: continued.

How it works - receiving deductions.

If somebody assigns 0 points to a particular group member, they will not alter his or her income. However, if someone assigns one deduction point to a group member, they will decrease the income of this group member by 3 MU. If someone assigns a group member 2 deduction points, they will decrease the group member's income by 6 MU, and so on. Each deduction point that is assigned to another group member will reduce his or her income by 3 MU.

Whether or by how much the income at the second stage is decreased in total depends on the total of the received deduction points. If somebody, for instance, receives a total of 4 deduction points (from all other group members in this period), his or her income would be decreased by 12 MU. If somebody receives a total of 5 deduction points, his or her income is reduced by 15 MU.

The maximum deduction someone can receive is limited to their earnings from stage 1.

So if somebody earned 27 MU in the first stage, they could only be deducted 27 MU in total.

This way it is **impossible** to end up with a negative balance.

Likewise, the amount one individual can spend on making deductions is limited to their second endowment of 30 MU. This again ensures that it is **impossible** to end up with a negative balance.

Your total income from the two stages is therefore calculated as follows:

Total income from Stage 1 and Stage 2 =

Income from first stage

- 3 x (sum of received deduction points)

+ your second endowment 30 MU

- costs of the deduction points you have assigned.”

Screen 5.

Please answer these six control questions. They will help you to understand how your income is calculated as a function of your decisions.

There is a calculator available.

After the questions, we will show you the correct responses.

Question 1: Suppose at the second stage you assign the following deduction points to your three other group members: -5, -4, 0. What are the total costs of your assigned deduction points?

Question 2: What are your costs if you assign a total of 0 points?

Question 3: By how many MU will your income from the first stage be changed if you receive a total of 0 deduction points from the other group members?

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Question 4: By how many MU will your income from the first stage be changed if you receive a total of 4 deduction points from the other group members?

Question 5: By how many MU will your income from the first stage be changed if you receive a total of 15 deduction points from the other group members?

Question 6: What is the amount of your second endowment which you can use for making deductions?

Screen 6a – Shown in the Immune Punisher scenario.

“Stage 2: The Deduction Stage

There is one more piece of information we need to tell you.

You will always be in a group of 4 persons but one person will not be able to **receive** deductions. These people will be chosen randomly by the computer at the start of the experiment.

If you are one of these people, then no-one can make deductions on your earnings.

If you are not one of these randomly chosen people, then people can make deductions on your earnings, and you will only be able to make deductions on 2 of your 3 group members.

To clarify, there will be 4 group members.

All 4 members can make deductions.

But only 3 members can receive deductions, one member cannot.

People that cannot receive deductions will never be able to receive deductions in all 5 rounds of the experiment.

People that can receive deductions will be able to receive deductions in all 5 rounds of the experiment, things will not change.

Please click the button to learn which type of group member you will be.”

1059 **Screen 6b – Shown in Sole Punisher scenario**

1060 **“Stage 2: The Deduction Stage**

1061 There is one more piece of information we need to tell you.

1062 You will always be in a group of 4 persons but only one person will be able to **make**
1063 deductions. All other players will not be able to make deductions, but they can **receive**
1064 deductions.

1065 These types of people will be chosen randomly by the computer at the start of the experiment.

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1067 If you can make deductions, then no-one can make deductions on your earnings.

1068 If you cannot make deductions, then the one member that can make deductions may make
1069 deductions on your earnings.

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1071 To clarify, there will be 4 group members.

1072 Only 1 member can make deductions.

1073 The other 3 members can all receive deductions.

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1075 People that cannot make but can receive deductions will never be able to make deductions
1076 and will always be able to receive deductions in all 5 rounds of the experiment.

1077 People that can make deductions will be able to make deductions in all 5 rounds of the
1078 experiment, things will not change.

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1080 Please click the button to learn which type of group member you will be.”

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1082 **Screen 7 – Shown in the Immune Punisher and Sole Punisher scenarios**

1083 **“Stage 2: The Deduction Stage**

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1085 Receiving deductions: You **can/cannot** receive deductions. Your group member(s)
1086 **can/cannot** reduce your earnings.

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1088 Making deductions: You **can/cannot** make deductions on your group members earnings.”

1089 [can or cannot was shown accordingly for each participant]

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Supplementary Table 1: Number of punishment victims. How many individuals did punishers target per round, depending on scenario and immunity status.

Scenario: immunity	Number of individuals that punisher punished that round					Obs.	N
	Punished no-one	Punished 1 other	Punished 2 others	Punished 3 others	Punished any		
Mutual Punishers	163 (41%)	102 (26%)	80 (20%)	55 (14%)	237 (59%)	400	80
Immune Punisher: non-immune	299 (47%)	176 (28%)	155 (25%)	N/A*	331 (53%)	630	126
Immune Punisher: immune	133 (63%)	40 (19%)	24 (11%)	13 (6%)	77 (37%)	210	42
Sole Punisher	105 (49%)	38 (18%)	53 (25%)	19 (9%)	110 (51%)	215	43
Totals^	700 (48%)	356 (24%)	312 (21%)	87 (11%)	755 (52%)	1,455	291

*these individuals shared a group with an immune individual, so they could only punish, at most, two other individuals.

^percentages will not sum to 100% because not all individuals could punish three groupmates.

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Supplementary Table 2: Frequency of Punishment. Punishing frequency by scenario and immunity status.

Scenario: immunity	<u>Punishing frequency</u>							N
	Never punished	1 round	2 rounds	3 rounds	4 rounds	5 rounds	Any rounds	
Mutual Punishers	17 (21%)	3 (4%)	7 (9%)	13 (16%)	19 (24%)	21 (26%)	63 (79%)	80
Immune Punisher: non-immune	29 (23%)	11 (9%)	15 (12%)	21 (17%)	23 (18%)	27 (21%)	97 (77%)	126
Immune Punisher: immune	15 (36%)	8 (19%)	6 (14%)	3 (7%)	2 (5%)	8 (19%)	27 (64%)	42
Sole Punisher	10 (23%)	8 (19%)	2 (5%)	4 (9%)	9 (21%)	10 (23%)	33 (77%)	43
Totals	71 (24%)	30 (10%)	30 (10%)	41 (14%)	53 (18%)	66 (23%)	220 (76%)	291

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Supplementary Table 3: Frequency of punishers. The count (and percentage) of punishers per round.

	Round 1	Round 2	Round 3	Round 4	Round 5	N
Mutual Punishers	42 (53%)	51 (64%)	48 (60%)	48 (60%)	48 (60%)	80
Immune Punisher: non-immune	65 (52%)	71 (56%)	65 (52%)	64 (51%)	66 (52%)	126
Immune Punisher: immune	19 (45%)	16 (38%)	14 (33%)	13 (31%)	15 (36%)	42
Sole Punisher	25 (58%)	24 (56%)	21 (49%)	20 (47%)	20 (47%)	43

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Supplementary Figure 1. Contributions by session. Mean contributions and 95% bootstrapped Confidence Intervals by Scenario and session (Mutual Punishers, N = four sessions; Immune Punisher and Sole Punisher scenarios, N = eight sessions each).

Supplementary Figure 2. The distribution of contributions. Frequency histograms of contributions by Scenario, Immunity status, and Round of the game (1-5). The modal contribution for immune individuals was always 0 MU, and in the final round, more than 50% of immune individuals contributed 0 MU. (Mutual Punishers scenario, N = 80; Immune Punishers Scenario, non-immune = 126, immune = 42; Sole Punisher scenario, non-immune = 129, immune = 43).

Supplementary Figure 3. The distribution of contributions by conditional cooperators. Frequency histograms of contributions by Scenario, Immunity status, and Round of the game (1-5) for Conditional Cooperators only (Mutual Punishers scenario, N = 54; Immune Punishers Scenario, non-immune = 72, immune = 24; Sole Punisher scenario, non-immune = 96, immune = 28). Due to technical errors only 380, and not all 420 individuals completed the strategy method for classification.

Supplementary Figure 4. Immune Conditional Cooperators learn to not to contribute. A repeat of Figure 2 but restricting all the data to just those individuals that were categorized as Conditional Cooperators prior to the game (Mutual Punishers, N = 54; Immune Punisher, immune, N = 24; non-immune, N = 72; Sole Punisher, immune = 28; non-immune = 96). Shown for each scenario are the mean (filled points), plus 95% confidence intervals, and the median (empty diamonds) contributions per individual per round, depending on player role (magenta = non-immune; blue = immune). Colored straight lines show, for the purposes of illustration only, linear regression estimates for each unique session*player role combination. Sessions were statistically modelled as random effects (N = 4 in Mutual Punishers; 8 in each of Immune Punisher and Sole Punisher scenarios). Immune Conditional Cooperators showed a greater decline in contributions than non-immune Conditional Cooperators in both the Immune Punisher scenario (glmer: round*immunity = -0.25 ± 0.043 , z value = -5.69 , $P <$

1139 0.001) and the Sole Punisher scenario (glmer: round*immunity = -0.36 ± 0.039 , z value = -
1140 6.81, $P < 0.001$).

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1145 **Supplementary Figure 5. Earnings from the experiment.** Shown are the mean earnings
1146 per round per scenario (colored points with black outlines) plus 95% bootstrapped
1147 Confidence Intervals, depending on immunity status (blue = immune; magenta = non-
1148 immune). Also shown are the highest and lowest earnings any individual made in that round
1149 (upwards/downwards pointing triangles respectively). Also shown are three reference lines,
1150 which apply equally to all scenarios: solid orange = 50 MU, the sum endowment per
1151 individual per round (20 MU for the contribution phase, and 30 MU for the punishment
1152 phase), earnings below this line represent a net loss; solid green = 62 MU, the cooperative
1153 maximum of full contributions and zero punishment; solid black = 74 MU, the selfish
1154 maximum possible individual earnings in any one round, requiring an individual to contribute
1155 0 MU, their groupmates to all contribute 20 MU, and the focal individual to neither punish

nor be punished. The lowest possible earnings were 0 MU. On average, punishment was destructive, leading to a net loss in the Mutual Punishers scenario (Total Endowment = 250 MU; Mean total earnings = 215.2 MU, 95% bootstrapped Confidence Intervals = 209.7, 219.9, MU). Two sessions have been excluded from this figure (Sessions 1 and 2; Immune Punisher and Sole Punisher scenarios respectively.). This was to enable fair comparisons, because in those sessions, the punishment budget was only 18 MU, not 30 MU, reducing the total endowment (orange line) by 12 MU.

Supplementary Figure 6. The frequency of immune punishers decreased over time.

Shown are the frequency of individuals that chose to punish in that particular round, depending on scenario and immunity (magenta = non-immune; blue = immune). Mutual Punishers, N = 80; Immune Punisher, immune, N = 42; non-immune, N = 126; Sole Punisher, immune = 43. Colored straight lines show, for the purposes of illustration only, linear regression estimates plus shaded standard errors, for each scenario*player role combination. There was a significant interaction between immunity and how the frequency of punishers changed over time (glmer: logistic regression, controlling for individual: round*immunity = -0.25 ± 0.107 , z value = -2.31, P = 0.021, N = 291 individuals). The frequency of immune punishers significantly decreased (glmer: round = -0.25 ± 0.103 , z value = -2.44, P = 0.015, N = 85 individuals).

APPENDIX: Screen shots of experiment (which was conducted in French).

Vous allez prendre part à une expérience économique qui a été financée uniquement à des fins de recherche académique.
Si vous lisez avec attention les instructions qui vont suivre, vous pouvez, selon vos décisions, gagner un montant raisonnable d'argent.
Il est donc très important que vous lisiez attentivement ces instructions.

Les instructions qui vous ont été distribuées sont uniquement destinées pour votre information personnelle.
Il ne vous est pas permis de communiquer pendant l'expérience.
Si vous avez la moindre question, n'hésitez pas à nous la poser. Enfreindre cette règle vous exclura de l'expérience et vous privera de tout paiement.
Si vous avez des questions, veuillez lever la main. Un membre de l'équipe d'expérimentateurs viendra vous répondre en privé.

Durant l'expérience, nous ne parlerons pas de CHF mais plutôt de UM (Unités Monétaires).
Au cours de l'expérience, vos gains seront calculés en UM.
À la fin de l'expérience, le montant total que vous avez gagné sera converti en CHF avec le taux suivant:
1 UM = 0.0400 CHF, donc 20 UM = 0.80 CHF.
À la fin de l'expérience, la somme engendrée vous sera immédiatement versée en espèces.

Nous décrivons le processus expérimental en dessous.

Continuer

Stage 1.1: Welcome to the experiment, rules and exchange rate.

La situation de décision

Vous allez apprendre comment l'expérience sera menée plus tard. Nous vous présentons d'abord une situation de décision base. Vous trouverez des questions de contrôle à la fin des instructions qui vous aideront à comprendre la situation de décision.

Vous serez dans un groupe composé de **4 personnes**. Chaque membre du groupe doit décider de la allocation de 20 UM. Vous pouvez mettre ces 20 UM sur **votre compte privé** ou vous pouvez les investir **entièrement ou partiellement** dans un projet. Chaque point que vous n'investissez pas dans le projet restera automatiquement dans votre compte privé.

Votre revenu du compte privé:

Vous gagnerez un UM pour chaque UM mis sur votre compte privé.
Par exemple, si vous avez mis 20 UM sur votre compte privé (et donc vous n'investissez pas au projet) votre revenu s'élèvera exactement à 20 UM sur votre compte privé.
Si vous mettez 6 UM sur votre compte, vous aurez un revenu de 6 UM provenant de ce compte.
Personne hormis vous ne perçoit quoique ce soit avec votre compte privé.

Continuer

Stage 1.2: Introducing the public good game decision.

Votre revenu du projet:

Chaque membre du groupe bénéficiera aussi du montant que vous investissez dans le projet. D'un autre côté, vous obtiendrez aussi un gain sur les investissements des autres membres du groupe. Le revenu de chaque membre du groupe sera déterminé comme suit:

Revenu du projet = somme de tous les contributions x 0.4

Si par exemple, la somme de toutes les contributions au projet est de 60 UM, alors vous et les autres membres de votre groupe recevrez $60 \times 0.4 = 24$ UM provenant du projet.
Si quatre membres du groupe contribuent un total de 10 UM au projet, vous et les autres membres recevrez chacun $10 \times 0.4 = 4$ UM.

Revenu total:

Votre revenu total est la somme de vos revenus de votre compte privé et de ceux du projet:

Revenu de votre compte privé (= 20 – contribution au projet)
 + Revenu du projet (= 0.4 x somme de toutes les contributions au projet)
 = Votre revenu total

[Continuer](#)

Stage 1.3: The public good game payoff.

Veuillez répondre aux quatre questions de contrôle. Elles vous aideront à comprendre comment est calculé votre revenu en fonction de vos décisions de répartition des 20 UM.

Il y a une calculatrice disponible.
Pour accéder à la calculatrice, cliquer sur l'image en bas à droite de votre écran.
Veuillez entrer vos réponses dans les espaces prévus à cet effet et appuyez sur « Continuer ».
Après chaque question, vous verrez les bonnes réponses.

Question 1: Chaque membre du groupe reçoit un don de 20 UM. Personne (vous inclus) ne contribue au projet.
Quel est votre revenu total (en UM)?

Quel est le revenu total de chaque autre membre du groupe?

[Continuer](#)

Votre revenu du projet:

Chaque membre du groupe bénéficiera aussi du montant que vous investissez dans le projet. D'un autre côté, vous obtiendrez aussi un gain sur les investissements des autres membres du groupe. Le revenu de chaque membre du groupe sera déterminé comme suit:

Revenu du projet = somme de tous les contributions x 0.4

Si par exemple, la somme de toutes les contributions au projet est de 60 UM, alors vous et les autres membres de votre groupe recevrez $60 \times 0.4 = 24$ UM provenant du projet.
Si quatre membres du groupe contribuent un total de 10 UM au projet, vous et les autres membres recevrez chacun $10 \times 0.4 = 4$ UM.

Revenu total:

Votre revenu total est la somme de vos revenus de votre compte privé et de ceux du projet:

Revenu de votre compte privé (= 20 – contribution au projet)
 + Revenu du projet (= 0.4 x somme de toutes les contributions au projet)
 = Votre revenu total

Stage 1.4: First of four payoff example questions. For all examples, if a participant answered incorrectly then they had to try one more time.

Voici les bonnes réponses.
Appuyez sur " Continuer " .

Question 1: Chaque membre du groupe reçoit un don de 20 UM. Personne (vous inclus) ne contribue au projet.
Quel est votre revenu total (en UM)?

Le bonnes réponse = 20 UM

Quel est le revenu total de chaque autre membre du groupe?

Le bonnes réponse = 20 UM

Continuer

Aide

Votre revenu du projet:

Chaque membre du groupe bénéficiera aussi du montant que vous investissez dans le projet.
D'un autre côté, vous obtiendrez aussi un gain sur les investissements des autres membres du groupe.
Le revenu de chaque membre du groupe sera déterminé comme suit:

Revenu du projet= somme de tous les contributions x 0.4

Si par exemple, la somme de toutes les contributions au projet est de 60 UM, alors vous et les autres membres de votre groupe recevrez $60 \times 0.4 = 24$ UM provenant du projet.
Si quatre membres du groupe contribuent un total de 10 UM au projet, vous et les autres membres recevrez chacun $10 \times 0.4 = 4$ UM.

Revenu total:

Votre revenu total est la somme de vos revenus de votre compte privé et de ceux du projet:

$$\begin{aligned} &\text{Revenu de votre compte privé} (= 20 - \text{contribution au projet}) \\ &+ \text{Revenu du projet} (= 0.4 \times \text{somme de toutes les contributions au projet}) \\ &= \text{Votre revenu total} \end{aligned}$$

Stage 1.5: the answers to the first payoff example. Answers to all examples were shown after a correct response, or two incorrect attempts.

Voici la deuxième question.

Question 2: Chaque membre du groupe a reçu un don de 20 UM. Vous investissez 20 UM dans le projet. Chacun des trois autres membres du groupe contribuent aussi de 20 UM au projet.
Quel est votre revenu total (en UM)?

Quel est le revenu total de chaque autre membre du groupe?

Continuer

Aide

Votre revenu du projet:

Chaque membre du groupe bénéficiera aussi du montant que vous investissez dans le projet.
D'un autre côté, vous obtiendrez aussi un gain sur les investissements des autres membres du groupe.
Le revenu de chaque membre du groupe sera déterminé comme suit:

Revenu du projet= somme de tous les contributions x 0.4

Si par exemple, la somme de toutes les contributions au projet est de 60 UM, alors vous et les autres membres de votre groupe recevrez $60 \times 0.4 = 24$ UM provenant du projet.
Si quatre membres du groupe contribuent un total de 10 UM au projet, vous et les autres membres recevrez chacun $10 \times 0.4 = 4$ UM.

Revenu total:

Votre revenu total est la somme de vos revenus de votre compte privé et de ceux du projet:

$$\begin{aligned} &\text{Revenu de votre compte privé} (= 20 - \text{contribution au projet}) \\ &+ \text{Revenu du projet} (= 0.4 \times \text{somme de toutes les contributions au projet}) \\ &= \text{Votre revenu total} \end{aligned}$$

Stage 1.6: the second payoff example.

Voici les bonnes réponse.
Appuyez sur " Continuer" .

Question 2: Chaque membre du groupe a reçu un don de 20 UM. Vous investissez 20 UM dans le projet. Chacun des trois autres membres du groupe contribuent aussi de 20 UM au projet.

Quel est votre revenu total (en UM)?

Le bonnes réponse = 32 UM

Quel est le revenu total de chaque *autre* membre du groupe?

Le bonnes réponse = 32 UM

Continuer

Aide

Votre revenu du projet:

Chaque membre du groupe bénéficiera aussi du montant que vous investissez dans le projet.
D'un autre côté, vous obtiendrez aussi un gain sur les investissements des autres membres du groupe.
Le revenu de chaque membre du groupe sera déterminé comme suit:

Revenu du projet= somme de tous les contributions x 0.4

Si par exemple, la somme de toutes les contributions au projet est de 60 UM, alors vous et les autres membres de votre groupe recevrez $60 \times 0.4 = 24$ UM provenant du projet.
Si quatre membres du groupe contribuent un total de 10 UM au projet, vous et les autres membres recevrez chacun $10 \times 0.4 = 4$ UM.

Revenu total:

Votre revenu total est la somme de vos revenus de votre compte privé et de ceux du projet:

Revenu de votre compte privé (= 20 – contribution au projet)
+ **Revenu du projet (= 0.4 x somme de toutes les contributions au projet)**
= **Votre revenu total**

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1200 Stage 1.7: the answers to the second payoff example.

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Voici la troisième question.

Question 3: Chaque membre reçoit un don de 20 UM. Les trois autres membres du groupe apportent un contribution totale de 30 UM au projet.

Quel est votre revenu total (en UM), si vous - en plus des 30 MU – investissez 0 UM au projet?

Quel est votre revenu total (en UM), si vous - en plus des 30 MU – investissez 10 UM au projet?

Quel est votre revenu total (en UM), si vous - en plus des 30 MU – investissez 15 UM au projet?

Continuer

Aide

Votre revenu du projet:

Chaque membre du groupe bénéficiera aussi du montant que vous investissez dans le projet.
D'un autre côté, vous obtiendrez aussi un gain sur les investissements des autres membres du groupe.
Le revenu de chaque membre du groupe sera déterminé comme suit:

Revenu du projet= somme de tous les contributions x 0.4

Si par exemple, la somme de toutes les contributions au projet est de 60 UM, alors vous et les autres membres de votre groupe recevrez $60 \times 0.4 = 24$ UM provenant du projet.
Si quatre membres du groupe contribuent un total de 10 UM au projet, vous et les autres membres recevrez chacun $10 \times 0.4 = 4$ UM.

Revenu total:

Votre revenu total est la somme de vos revenus de votre compte privé et de ceux du projet:

Revenu de votre compte privé (= 20 – contribution au projet)
+ **Revenu du projet (= 0.4 x somme de toutes les contributions au projet)**
= **Votre revenu total**

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1203 Stage 1.8: the third payoff example (now with three instead of two questions).

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Voici les bonnes réponse.
Appuyez sur " Continuer" .

Question 3: Chaque membre reçoit un don de 20 UM. Les trois autres membres du groupe apportent un contribution totale de 30 UM au projet.
Quel est votre revenu total (en UM), si vous - en plus des 30 MU – investissez 0 UM au projet?
Le bonnes réponse = 32 UM

Quel est votre revenu total (en UM), si vous - en plus des 30 MU – investissez 10 UM au projet?
Le bonnes réponse = 26 UM

Quel est votre revenu total (en UM), si vous - en plus des 30 MU – investissez 15 UM au projet?
Le bonnes réponse = 23 UM

Continuer

Aide

Votre revenu du projet:

Chaque membre du groupe bénéficiera aussi du montant que vous investissez dans le projet.
D'un autre côté, vous obtiendrez aussi un gain sur les investissements des autres membres du groupe.
Le revenu de chaque membre du groupe sera déterminé comme suit:

Revenu du projet= somme de tous les contributions x 0.4

Si par exemple, la somme de toutes les contributions au projet est de 60 UM, alors vous et les autres membres de votre groupe recevrez $60 \times 0.4 = 24$ UM provenant du projet.
Si quatre membres du groupe contribuent un total de 10 UM au projet, vous et les autres membres recevrez chacun $10 \times 0.4 = 4$ UM.

Revenu total:

Votre revenu total est la somme de vos revenus de votre compte privé et de ceux du projet:

Revenu de votre compte privé (= 20 – contribution au projet)
+ Revenu du projet (= 0.4 x somme de toutes les contributions au projet)
= Votre revenu total

Stage 1.9: the answers to the third payoff example.

Voici la dernière question.

Question 4: Chaque membre du groupe reçoit un don de 20 UM. Supposons que vous investissez 8 UM au projet.
Quel est votre revenu total (en UM) si les autres membres du groupe ensemble – en plus de vous 8 UM contribuent avec 7 UM supplémentaires au projet?

Quel est votre revenu total (en UM) si les autres membres du groupe ensemble – en plus de vous 8 UM contribuent avec 12 UM supplémentaires au projet?

Quel est votre revenu total (en UM) si les autres membres du groupe ensemble – en plus de vous 8 UM contribuent avec 22 UM supplémentaires au projet?

Continuer l'expérience

Aide

Votre revenu du projet:

Chaque membre du groupe bénéficiera aussi du montant que vous investissez dans le projet.
D'un autre côté, vous obtiendrez aussi un gain sur les investissements des autres membres du groupe.
Le revenu de chaque membre du groupe sera déterminé comme suit:

Revenu du projet= somme de tous les contributions x 0.4

Si par exemple, la somme de toutes les contributions au projet est de 60 UM, alors vous et les autres membres de votre groupe recevrez $60 \times 0.4 = 24$ UM provenant du projet.
Si quatre membres du groupe contribuent un total de 10 UM au projet, vous et les autres membres recevrez chacun $10 \times 0.4 = 4$ UM.

Revenu total:

Votre revenu total est la somme de vos revenus de votre compte privé et de ceux du projet:

Revenu de votre compte privé (= 20 – contribution au projet)
+ Revenu du projet (= 0.4 x somme de toutes les contributions au projet)
= Votre revenu total

Stage 1.10: the fourth payoff example.

Voici les bonnes réponses.
Appuyez sur " Continuer" .

Question 4: Chaque membre du groupe reçoit un don de 20 UM. Supposons que vous investissez 8 UM au projet.

Quel est votre revenu total (en UM) si les autres membres du groupe ensemble – en plus de vous 8 UM contribuent avec 7 UM supplémentaires au projet?

Le bonnes réponse = 18 UM

Quel est votre revenu total (en UM) si les autres membres du groupe ensemble – en plus de vous 8 UM contribuent avec 12 UM supplémentaires au projet?

Le bonnes réponse = 20 UM

Quel est votre revenu total (en UM) si les autres membres du groupe ensemble – en plus de vous 8 UM contribuent avec 22 UM supplémentaires au projet?

Le bonnes réponse = 24 UM

[Continuer l'expérience](#)

Aide

Votre revenu du projet:

Chaque membre du groupe bénéficiera aussi du montant que vous investissez dans le projet.
D'un autre côté, vous obtiendrez aussi un gain sur les investissements des autres membres du groupe.
Le revenu de chaque membre du groupe sera déterminé comme suit:

Revenu du projet= somme de tous les contributions x 0.4

Si par exemple, la somme de toutes les contributions au projet est de 60 UM, alors vous et les autres membres de votre groupe recevrez $60 \times 0.4 = 24$ UM provenant du projet.
Si quatre membres du groupe contribuent un total de 10 UM au projet, vous et les autres membres recevrez chacun $10 \times 0.4 = 4$ UM.

Revenu total:

Votre revenu total est la somme de vos revenus de votre compte privé et de ceux du projet:

Revenu de votre compte privé (= 20 – contribution au projet)
+ Revenu du projet (= 0.4 x somme de toutes les contributions au projet)
= Votre revenu total

Stage 1.11: the answers to the fourth payoff example.

Round

1 of 1

Vous allez maintenant prendre cette décision pour un cas particulier. Plutôt que de simplement faire une **contribution non-conditionnelle**, vous ferez AUSSI une liste de contributions **conditionnées par la contribution des partenaires**.

Votre tâche consiste à indiquer le nombre de UM que vous souhaitez investir dans le projet en fonction de chaque contribution moyenne possible des autres membres du groupe (arrondi au nombre entier le plus proche).
Vous pouvez varier votre contribution par rapport à celle des autres membres du groupe.

Un membre de votre groupe sera ensuite sélectionné pour mettre en application sa **contribution conditionnelle**, tandis que les 3 autres membres du groupe mettront en application leur **contribution non-conditionnelle**.
Ainsi, pour un des membres du groupe, ses gains seront calculés en fonction de la contribution moyenne des 3 autres membres du groupe, ainsi que du montant de sa propre contribution conditionnelle correspondant à ce montant moyen.

Par contre, pour les 3 autres membres du groupe, leurs gains respectifs seront calculés en utilisant leur contribution **non-conditionnelle**.

On ne vous divulguera pas vos gains maintenant, mais vous recevrez la somme correspondante à la fin de l'expérience. Après l'expérience, seul l'expérimentateur aura connaissance de vos contributions conditionnelles et non-conditionnelles, et vos décisions resteront anonymes.
En clair, votre tableau des contributions n'aura **absolument aucune conséquence future après ce tour de prise de décision**.

[Je comprends](#)

Instructions

Stage 2.1: Introducing the strategy method to measure social preferences (e.g. 'Conditional Cooperation' or 'Free Rider').

Round

1 of 1

Remaining time 118

Entrez votre contribution **non-conditionnelle** au projet (0-20 UM).

Si vous ne savez pas quelle est la contribution des membres de votre groupe

Entrez votre **conditionnelle** contribution au projet (tableau des contributions).

Si les membres de votre groupe contribuent, en moyenne, 0

Si les membres de votre groupe contribuent, en moyenne, 1

Si les membres de votre groupe contribuent, en moyenne, 2

Si les membres de votre groupe contribuent, en moyenne, 3

Si les membres de votre groupe contribuent, en moyenne, 4

Si les membres de votre groupe contribuent, en moyenne, 5

Si les membres de votre groupe contribuent, en moyenne, 6

Si les membres de votre groupe contribuent, en moyenne, 7

Si les membres de votre groupe contribuent, en moyenne, 8

Si les membres de votre groupe contribuent, en moyenne, 9

Si les membres de votre groupe contribuent, en moyenne, 10

Si les membres de votre groupe contribuent, en moyenne, 11

Si les membres de votre groupe contribuent, en moyenne, 12

Si les membres de votre groupe contribuent, en moyenne, 13

Si les membres de votre groupe contribuent, en moyenne, 14

Si les membres de votre groupe contribuent, en moyenne, 15

Si les membres de votre groupe contribuent, en moyenne, 16

Si les membres de votre groupe contribuent, en moyenne, 17

Si les membres de votre groupe contribuent, en moyenne, 18

Si les membres de votre groupe contribuent, en moyenne, 19

Si les membres de votre groupe contribuent, en moyenne, 20

Confirmer

Instructions

Vous devez prendre deux décisions.

La première décision est de jouer de manière *inconditionnelle* avec les membres de votre groupe.

Vous ne saurez pas ce qu'ils vont faire de leur côté. Il y a 75% de chances que cela corresponde à votre contribution réelle à la fin du tour.

Cependant, il y a 25% de chances que votre contribution réelle soit déterminée à partir de votre deuxième décision, comme suit.

Pour la deuxième décision, vous avez la possibilité de conditionner votre contribution, dans le tableau des contributions, par rapport à ce que les membres de votre groupe décideraient.

Round

1 of 1

La contribution moyenne des membres de votre groupe a été de 0 UM.

Par conséquent, votre contribution **conditionnelle** correspondante était 0 UM (cette contribution a 25% de chances d'être réalisée).

Votre contribution **non-conditionnelle** était 0 UM (et a 75% de chances d'être réalisée).

Votre contribution réelle est 0 UM.

Vos bénéfices sont en cours de calcul.

Il n'y a pas d'autre retour pour ce tour, mais l'argent que vous avez gagné sera ajouté à votre revenu final.

Continuez

Instructions

Vos bénéfices sont en cours de calcul.

Round

1 of 1

Vous allez maintenant répéter les décisions que vous venez de prendre, mais dans un nouveau **cas particulier**. Dans ce cas-ci, vous serez dans un groupe composé uniquement de vous et de L'ORDINATEUR. **Tout le reste du tour se déroulera de la même manière** qu'avant, la seule différence étant qu'au lieu de 3 autres personnes, vous jouerez seulement avec l'ordinateur.

L'ordinateur prendra les décisions en lieu et place des 3 autres membres du groupe virtuel. Les décisions de l'ordinateur seront prises **de manière aléatoire et indépendante** (chaque joueur virtuel prendra donc sa propre décision au hasard).

Vous êtes **le seul membre humain, réel dans votre groupe**, et vous seul recevrez de l'argent à l'issue du tour. Votre revenu sera calculé comme expliqué durant les instructions initiales. Votre revenu sera déterminé comme si les autres membres de votre groupe utilisaient de l'argent réel, bien qu'ils ne soient en réalité qu'un ordinateur décidant au hasard.

Vous allez maintenant jouer ce cas spécial lors d'un tour unique. Vous ne recevrez aucune information sur vos gains obtenus lors ce tour jusqu'à ce que l'expérience soit terminée, mais c'est une vraie décision avec de l'argent réel à la clé. Seul l'expérimentateur aura connaissance de votre décision et cela n'aura aucune conséquence pour vous plus tard au cours de l'expérience, mis à part le fait de vous créer des revenus supplémentaires à l'issue de ce tour. Vos revenus obtenus lors de ce tour seront ajoutés à votre revenu final d'aujourd'hui.

Je comprends que je suis dans un groupe avec l'ordinateur seulement

Stage 2.4: Repeating the strategy method, but with the computerized groupmates.

Round

1 of 1

Remaining time 119

Entrez votre contribution **non-conditionnelle** au projet (0-20 UM).

Si vous ne savez pas combien l'ordinateur contribue

Entrez votre contribution **conditionnelle** au projet (tableau des contributions).

Si l'ordinateur contribue, en moyenne, 0	<input type="text"/>
Si l'ordinateur contribue, en moyenne, 1	<input type="text"/>
Si l'ordinateur contribue, en moyenne, 2	<input type="text"/>
Si l'ordinateur contribue, en moyenne, 3	<input type="text"/>
Si l'ordinateur contribue, en moyenne, 4	<input type="text"/>
Si l'ordinateur contribue, en moyenne, 5	<input type="text"/>
Si l'ordinateur contribue, en moyenne, 6	<input type="text"/>
Si l'ordinateur contribue, en moyenne, 7	<input type="text"/>
Si l'ordinateur contribue, en moyenne, 8	<input type="text"/>
Si l'ordinateur contribue, en moyenne, 9	<input type="text"/>
Si l'ordinateur contribue, en moyenne, 10	<input type="text"/>
Si l'ordinateur contribue, en moyenne, 11	<input type="text"/>
Si l'ordinateur contribue, en moyenne, 12	<input type="text"/>
Si l'ordinateur contribue, en moyenne, 13	<input type="text"/>
Si l'ordinateur contribue, en moyenne, 14	<input type="text"/>
Si l'ordinateur contribue, en moyenne, 15	<input type="text"/>
Si l'ordinateur contribue, en moyenne, 16	<input type="text"/>
Si l'ordinateur contribue, en moyenne, 17	<input type="text"/>
Si l'ordinateur contribue, en moyenne, 18	<input type="text"/>
Si l'ordinateur contribue, en moyenne, 19	<input type="text"/>
Si l'ordinateur contribue, en moyenne, 20	<input type="text"/>

Confirmer

Instructions

Vous devez prendre deux décisions.
Pour la première décision, vous jouerez de manière *non-conditionnelle* avec l'ordinateur.
Vous ne savez pas ce que l'ordinateur fera, mais il contribuera au projet au hasard. Comme auparavant, il y a 75% de chances que ce soit votre contribution réelle finale.
Par contre, il y a 25% de chances que votre contribution soit déterminée à partir de votre deuxième décision, comme suit.
Pour la seconde décision, vous avez la possibilité de varier votre contribution, dans le tableau des contributions, en fonction de la décision de l'ordinateur.

Stage 2.5: completing the strategy method with computerized groupmates.

Round
1 of 1

La contribution moyenne de l'ordinateur était 10 UM.
Par conséquent, votre contribution **conditionnelle** correspondante était 0 UM (cette contribution a 25% de chances d'être réalisée).
Votre contribution **inconditionnelle** s'élevait à 0 UM (il y a 75% de chances qu'elle soit réalisée).

Votre contribution réelle finale est de 0 UM.

Vos bénéfices sont en cours de calcul.
Vous ne recevez pas d'information sur vos gains pour ce tour, mais tout l'argent que vous avez gagné sera ajouté à votre revenu final.

Instructions
Vos bénéfices sont en cours de calcul.

Continuer

1232

1233

Stage 2.6: feedback from the strategy method with computers. We did not show payoff information.

1234

1235

Round
1 of 5

Vous allez maintenant prendre part à la dernière section de l'expérience.
Durant cette partie, vous devrez faire face au même scénario que celui décrit dans les instructions initiales.
Vous serez dans un groupe de 4 personnes, composé de vous-même et 3 autres personnes réelles.

Il y aura 5 tours pour lesquels vous devrez prendre à chaque fois une décision. À chaque étape, vous serez placé dans un nouveau groupe avec des personnes différentes. Vous ne serez **jamais** groupé avec la même personne deux fois.

Dans chacun des 5 tours, vous serez placé dans un groupe avec 3 nouvelles personnes, et cela s'applique à tous les participants de l'expérience.
Ainsi, chacun prendra 5 tours de décision au sein de groupes de 4. **Mais il n'y aura jamais deux personnes dans le même groupe plus d'une fois.**
Il y a 20 (ou bien 24) personnes qui participent à l'expérience. Vous serez groupé avec 3 personnes différentes à 5 reprises, ce qui signifie que vous interagirez avec 15 personnes différentes au total.

Lors de chaque tour, il y aura deux étapes à la prise de décision, que nous allons vous expliquer maintenant.

Pour commencer, les 4 d'entre vous prendront une décision non-conditionnelle, comme décrit dans les instructions initiales.
Ce sera la fin de la première étape.

Appuyez sur continuer pour en apprendre d'avantage sur la seconde étape.

Continuer

1236

1237

Stage 3.1: Introducing the repeated game with perfect stranger matching.

1238

Stage 3.2: introducing the punishment mechanism.

Stage 3.3: explaining further how the punishment mechanism affects payoffs.

Round

1 of 5

Veuillez répondre aux six questions de contrôle. Elles vous aideront à comprendre comment est calculé votre revenu en fonction de vos décisions.

Il y a une calculatrice disponible en cas de besoin.
Pour utiliser la calculatrice, cliquez sur l'image en bas à droite de votre écran.
Veuillez entrer vos réponses dans les espaces prévus à cet effet, puis appuyez sur «Continuer».
Après les questions, vous pourrez voir les bonnes réponses.

Question 1: Supposons que lors de la seconde étape, vous infligez les points de retenue suivants aux 3 autres membres du groupe: 5, 4 et 0 respectivement. Quel est le coût total d'infliction pour ces points de retenues?

Question 2: Quels sont vos coûts si vous attribuez un total de 0 points?

Question 3: De combien de UM sera modifié votre revenu de la première étape, si vous recevez un total de 0 points de retenue infligé par les autres membres du groupe?

Question 4: De combien de UM sera modifié votre revenu de la première étape, si vous recevez un total de 4 points de retenue infligé par les autres membres du groupe?

Question 5: De combien de UM sera modifié votre revenu de la première étape, si vous recevez un total de 15 points de retenue infligé par les autres membres du groupe?

Question 6: Quel est le montant de la deuxième dotation que vous pouvez utiliser pour infliger des retenues?

Continuer

Instructions

Étape 2: L'étape de retenue
Dans la seconde étape, vous verrez à l'écran le détail des décisions de chaque membre du groupe.

Lors de cette étape, vous pouvez diminuer le revenu de chaque autre membre du groupe en attribuant **points de retenue** ou vous pouvez laisser le revenu **intact**. Les autres membres du groupe peuvent également diminuer votre revenu s'ils le souhaitent.

Comment ça marche: faire des retenues sur les revenus.
Vous devrez décider si vous attribuez de points de retenue à chacun des 3 autres membres du groupe, et si oui, combien. Dans tous les cas, vous devrez entrer un numéro pour chacun d'eux. Si vous ne souhaitez pas modifier le revenu d'un membre spécifique du groupe, vous devrez entrer 0.

Stage 3.4: six questions testing comprehension of the punishment mechanism.

Round

1 of 5

Voici les bonnes réponses.

Question 1: Supposons que lors de la seconde étape, vous infligez les points de retenue suivants aux 3 autres membres du groupe: -5, -4 et 0 respectivement. Quel est le coût total d'infliction pour ces points de retenues?
Question 1: **La bonne réponse est 9 MU**

Question 2: Quels sont vos coûts si vous attribuez un total de 0 points?
Question 2: **La bonne réponse est 0 MU**

Question 3: De combien de UM sera modifié votre revenu de la première étape, si vous recevez un total de 0 points de retenue infligé par les autres membres du groupe?
Question 3: **La bonne réponse est 0 MU**

Question 4: De combien de UM sera modifié votre revenu de la première étape, si vous recevez un total de 4 points de retenue infligé par les autres membres du groupe?
Question 4: **La bonne réponse est 12 MU**

Question 5: De combien de UM sera modifié votre revenu de la première étape, si vous recevez un total de 15 points de retenue infligé par les autres membres du groupe?
Question 5: **La bonne réponse est 45 MU**

Question 6: Quel est le montant de la deuxième dotation que vous pouvez utiliser pour infliger des retenues?
Question 6: **La bonne réponse est 30 MU**

Continuer

Stage 3.5: showing the answers to the six questions.

Round

1 of 5

Remaining time 58

Subir des retenues: Vous **pouvez** recevoir des retenues. Votre (vos) membre(s) de groupe peuvent réduire vos revenus.

Veuillez saisir votre contribution (entre 0 - 20)

Votre contribution au projet

Confirmer

Instructions

Veuillez saisir votre contribution (entre 0 - 20)

Lorsque vous êtes prêt, cliquez sur le bouton "Confirmer".

Rappel des règles - Vous faites partie d'un groupe de 1. Chaque personne reçoit une dotation de 20 UM par tour

Remarque: vous obtiendrez un nouveau fonds de dotation de 20 UM pour chaque tour.

À chaque tour, vous êtes groupé de manière aléatoire avec 0 autres personnes.

Vous ne serez jamais associé avec la même personne deux fois.

Stage 3.6: Contributing to the public good.

1 of 1

Remaining time 104

Person	Contribution (0 - 20)	Gains acquis lors de cette étape
Person A	1	30.2
C'est toi	9	22.2
Person C	13	18.2
Person D	5	26.2
Contributions totales	28	
Total des UM à partager équitablement	44.8	

OK, passez à l'étape suivante

Instructions

Sur cette page est répertorié les décisions et les gains de tous les joueurs dans votre groupe (dans un ordre aléatoire, vous inclus) pour ce tour.

N'oubliez pas que les termes Person A, B, C & D ne sont pas importants b0 car vous jouez avec des personnes sélectionnées au hasard à chaque tour et vous ne serez jamais jumelé avec la même personne deux fois.

Veuillez appuyer sur le bouton "Continuer" lorsque vous êtes prêt.

Stage 3.7: Feedback from the contribution stage. Players were shown in random order.

Round

1 of 1

Remaining time 56

Nom	Contribution	Revenu personnel =	UM conservés	+ UM retourné	= Total UM	Entrez votre retenue (0 - 10)
person A	14	person A	6	8.0	14.0	Impossible de retenir sur le revenu
person B	2	person B	18	8.0	25.0	<input type="text"/>
c'est toi	1	*c'est toi*	19	8.0	27.0	*c'est toi*
person D	3	person D	17	8.0	25.0	<input type="text"/>

OK, move onto the next round

Instructions

Étape 2: L'étape de retenue
Dans la seconde étape, vous verrez à l' écran le détail des décisions de chaque membre du groupe.

Lors de cette étape, vous pouvez diminuer le revenu de chaque autre membre du groupe en attribuant **points de retenue** ou vous pouvez laisser le revenu **intact**. Les autres membres du groupe peuvent également diminuer votre revenu s'ils le souhaitent.

Comment ça marche: faire des retenues sur les revenus.
Vous devrez décider si vous attribuez des points de retenue à **chacun** des 3 autres membres du groupe, et si oui, combien. Dans tous les cas, vous devrez entrer un numéro pour chacun d'eux. Si vous ne souhaitez pas modifier le revenu d'un membre spécifique du groupe, vous devrez entrer 0.

Chaque point de retenue attribué vous coûte 1 UM. Par exemple, si vous attribuez 2 points de retenue à un membre, cela vous coûtera 2 UM; si, en outre, vous attribuez 5 points de retenue à un autre membre, cela vous coûtera 5 UM supplémentaires; et si vous attribuez 0 points au dernier membre du groupe, cela ne vous coûte rien de plus. Au total, dans cet exemple, vous auriez attribué 7 points de retenue et vos coûts totaux de retenue s'élèveront donc à 7 UM (2 + 5 + 0).

Round

1 of 1

Remaining time 112

La première étape	
Votre contribution	5.0
Vos gains de la première étape	25.2

La deuxième étape	
Vos retenues subies	-2.0
Coût des retenues subies	-6.0
Votre nouveau solde	20.2

Votre dotation pour infliger des retenues	30.0
Vos dépenses en retenues infligées	-1.0
Votre solde final pour ce tour	49.2

Continuez OK, passez au prochain tour

Instructions

Cet cette page est répertorié vos gains après les deux étapes pour ce tour.

S'il vous plaît appuyez sur le bouton "Continuer" lorsque vous êtes prêt.