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Intuitive cooperation refuted:

Commentary on Rand *et al.* (2012) and Rand *et al.* (2014)[*]

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Abstract:

We show that Rand *et al.* (2012) and Rand *et al.* (2014)—who argue that cooperation is intuitive—provide an incorrect interpretation of their own data. They make the mistake of inferring intuition from relative decision times alone, without taking into account absolute decision times. We re-examine their data and find that the vast majority of their responses are slow, exceeding four seconds, even in time-pressure treatments intended to promote intuitive responses. Further, a plot of the average cooperation rates by decision time fails to yield a monotonically decreasing relationship. However, among the few decisions that were relatively fast, there appears to be a positive—not negative—association between decision time and cooperation. We conclude that the data presented by Rand *et al.* (2012) and Rand *et al.* (2014) fail to provide evidence for the hypothesis that cooperation is intuitive. If anything, their data indicate the opposite.

JEL Classification: D03, D64, H40

Keywords: Cooperation, Intuition, Decision times, Pro-social behavior

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1. Introduction

In their paper entitled "Spontaneous giving and calculated greed," Rand *et al.* (2012) argue that cooperation is the product of 'intuition' and greed of 'deliberation'. The premise for their analysis is that intuition is fast, but deliberation slow. Their conclusion—that "our first impulse is to cooperate" (p. 429)—is based on two empirical patterns from cooperation games: that (1) the degree of cooperation is negatively associated with decision times, and (2) inducing faster decision times causes more cooperation. A re-examination of their data, however, reveals that their conclusions about the relationship between intuition and cooperation are unwarranted. The authors infer intuition from relative decision times alone—which are all *slow*—without documenting the presence of *very fast* decision times, of which there are virtually none. Any inference about the role of intuition over deliberation in shaping cooperative behavior, however, would require that we establish the presence of very fast decisions—to rule out deliberation. Otherwise, differences in decision times may simply reflect differences in consciously controlled deliberation times; deliberation times can vary substantially—depending, for example, on depth and complexity of reasoning. To make matters more complicated, intuition—or impulse—may even arise as a delayed response, implying the possibility that intuition and deliberation coexist.

We organize our critique into three parts. First, we consider the data and the claims from Rand *et al*. (2012), who pioneered the study of decision times and cooperation. We show that the evidence presented by the authors does not allow the conclusions drawn. Second, we consider the additional data provided by Rand, Peysakhovich, Kraft-Todd, Newman, Wurzbacher, Nowak, and Greene (2014). They included all studies completed by the research group "in which subjects (i) were randomized into either time pressure or time delay while (ii) deciding to pay a cost to give a greater benefit one or more others" (p. 10). Here, too, we show that the evidence does not allow the conclusions drawn. Third, we consider alternative approaches to the data. These, however, also fail to provide evidence for the hypothesis that cooperation is a spontaneous response. In fact, it would be more appropriate to claim some evidence for the opposite conclusion.

2. No evidence of spontaneous cooperation in Rand *et al.* (2012)

The crux of Rand *et al*.'s (2012) argument is that individuals, who were randomly assigned to experimental treatments that were intended to reduce decision times, contributed more than did those assigned to treatments intended to raise decision times. The authors use two different manipulations to influence decision times: (a) time pressure treatments, in Studies 6 and 7, and (b) conceptual priming treatments, in Studies 8 and 9. However, median decision times in the time pressure treatments are 10 seconds in both studies, far exceeding any reasonable threshold for conscious processing, which would

be in the hundreds of milliseconds (Schneider & Shiffrin, 1977; Posner & Rothbart, 1998). Neither of the time pressure treatments yield a sizeable portion of fast responses. In Study 6, a mere 2.87 percent of the responses in the time-pressure treatment were made in less than four seconds. In Study 7, none responded within four seconds in the time pressure treatment. Thus, although participants in the time pressure treatments did decide quicker than did participants in the time delay treatments (Study 6 median decision times = 10 vs. 22 seconds; Study 7 median decision times = 10 vs. 21 seconds), and although mean cooperation in the former was also arguably higher than cooperation in the latter (Study 6: means = \$0.23 vs. \$0.22, $t(678) = -1.62$, $p = 0.107$; Study 7: means = \$1.98 vs. \$1.63, $t(209) = -1.61$, $p = 0.108$), there is no direct evidence of spontaneous decisions in the time pressure treatments.[1] Because decisions in either treatment are sufficiently slow to allow deliberation, we may not infer—as Rand *et al.* (2012) do—that the intuitive response, in the meaning spontaneous or automatic, is to cooperate. The observed differences in cooperation may result from differences in degree and type of consciously controlled deliberations, inasmuch as from differences in spontaneous versus deliberative choices. Moreover, intuition and deliberation might both be present in either condition, and the relative degree of each is unknown.

The same can be said for the treatment that attempted to prime intuitive processing in Study 9, with a median response time of 9 seconds, and a mere 1.63 percent of decisions reported in less than four seconds. However, it is important to note that there are no treatment differences in decision times; mean decision times for the intuitive and deliberative treatments (13.0 and 13.7 seconds, respectively) were statistically indistinguishable ($t(252) = 0.35$, $p = 0.730$). Rand *et al*. (2012) are only able to find an effect among the 87 participants classified as a "naïve," when using an extensive array of controls in an OLS regression on log10 decision times (see table S13, model 2; Supplementary Information section). It is thus rather problematic to use the higher cooperation rate in the intuitive treatment (means = \$0.26 vs. \$0.23; $t(254) = -1.67$, $p = 0.096$) as evidence for the claim that cooperation is the intuitive response. Study 8 also reported a higher cooperation rate in the intuitive treatment (means = \$0.26 vs. \$0.21, $t(341) = -2.44$, $p = 0.015$), but the decision time data for this study are not available.[2]

The second type of evidence presented as support for the proposition that cooperation is the intuitive response, is correlational—that decision times are negatively associated with cooperation. Rand *et al.* (2012) present negative correlations for studies 1-5.[3] However, as with the experimental treatments intended to influence decision times, the correlational evidence is of little value to their

1 The mean differences in cooperation are statistically significant when the comparison is confined to participants who obeyed the time constraints (study 6: means = \$0.27 vs. \$0.22, $t(415) = -3.47$, $p < 0.001$; study 7: means = \$2.31 vs. \$1.69, $t(149) = -2.35$, $p = 0.020$). Tinghög *et al.* (2013), however, make a case for not excluding participants who failed to obey the time constraints.

2 According to the Supplemental Information for Rand *et al.* (2012), the decision time data were not recorded due to a technical problem (p. 19).

3 Study 1 is presented in the main body of Rand *et al.* (2012), whereas Studies 2-5 are presented in the Supplementary Information section.

proposition in the absence of very fast decisions. Among Rand *et al.*'s studies for which decision times are publicly available (all, except 8), there is not one that yields a substantial portion of decisions close to the consciousness threshold. In fact, the share of decisions recorded within four seconds ranges from 0% (Study 7) to 2.76% (Study 9). Most decisions are slow, allowing ample time to deliberate. Hence, without evidence of decisions so fast that deliberation would be implausible, we cannot rule out differences in consciously controlled deliberation as the source of the correlation.[4]

3. No evidence of spontaneous cooperation in Rand *et al*. (2014)

In response to Tinghög *et al.* (2013), who found no positive time-pressure effect, Rand *et al*. (2013) refer to new data, later published by Rand *et al*. (2014), to reinforce their conclusion that cooperation is spontaneous.[5] Rand *et al*. (2014) pool data from all time pressure studies carried out by their research group, including Rand *et al*. (2012), yielding a total of 6913 decisions, across 15 studies. All studies, except F, feature one-shot games. However, this substantial data set tells the same story as that told by Rand *et al*. (2012). Median decision times in the time pressure treatments of one-shot games range from 6 seconds (Studies J, K, M, N, and O) to 13 (Study B), and none yield a large portion of decisions close the consciousness threshold. The share of decisions recorded within four seconds ranges from 0% (Study D) to 11.22% (Study M). With little evidence of fast decisions, we cannot rule out deliberation for the vast majority of decisions, and so we cannot attribute treatment differences in cooperation levels to intuition.

Pooling all their data, we may examine the distribution of decisions across decision times, and plot the average contributions for each one-second interval (see Figure 1, plot a and b, respectively). In their pooled sample across studies A to O, the vast majority (92.71%) used four seconds or more to make a decision. Moreover, a striking result appears in Figure 1, plot b): there is no clear relationship between decision times and contributions. Although the pooled data set yields a negative and significant association between log10 of decision times and contributions (OLS regression: coefficient = -0.1062, $n = 6829$, $p < 0.001$), it is not significant when regressing contributions on the raw decision

[4] A similar argument is lodged by Myrseth and Wollbrant (2016), who criticize Cappelen *et al.* (2015) for attributing fair choices in a dictator game to intuition on the basis of the former (mean = 38.4 seconds) occurring faster than the latter (mean = 48.5 seconds). More generally, Krajbich *et al.* (2015) argue that it is problematic to draw inferences from decision times about the relative role of intuitive versus deliberative processes in choice; asymmetries in decision times can be accounted for by differences in strength of preference or discriminability of choice options.

[5] Tinghög *et al.* (2013) attempted a series of replications, but unlike Rand *et al.* (2012), they exclude participants who have failed comprehension; Rand *et al.* (2012) controlled for comprehension in their regressions. Moreover, Tinghög *et al.* (2013) include respondents who disobeyed the time-constraints, highlighting the problem of excluded these, as Rand *et al.* (2012) originally did. It is also worth noting that Tinghög *et al.* (2013) found one negative effect of time-pressure on cooperation, at the ten-percent level, in experiment 4.

times (OLS regression: coefficient = -0.0003, n = 6829, p = 0.124).[6] Moreover, the association between contributions and raw decision times is positive and significant among those who used less than four seconds (OLS regression: coefficient = 0.0905, n = 504, p = 0.024).[7] A positive and significant association is obtained for all thresholds from 3 to 6 seconds.

Figure 1a here

Figure 1b here

In sum, the data presented by Rand *et al*. (2012) and Rand *et al.* (2014) do not allow the inference that cooperation is intuitive and greed calculated. Rather, most decision makers take their time, and the few who do not cooperate less.

4. Alternative approaches to the data in Rand *et al*. (2014)

Rand *et al*. (2014) present data from a variety of economic games, including dictator games, trust games, prisoner's dilemma games, and public good games—the latter both one-shot and repeated with random-matching. We now restrict our analysis to the one-shot public good games and to prisoner's dilemmas—excluding the dictator game (Study M), the trust game (Study B), and repeated rounds of the public goods game (Study F). Doing so preserves 85 percent of their observations, and it may provide a clearer perspective on the relation between cooperation and decision times.

We start by examining mean cooperation rates by decision time. The proposition that cooperation is spontaneous would require that cooperation falls in the first few seconds—when impulse gives to deliberation. As we can see from Figure 2, there is no meaningful comparison to be made of one- versus two-second decisions, as only two decisions were made in one second. A more informative test would be to regress raw decision times on cooperation, with upward restrictions on

[6] In keeping with the analysis in Rand et al. (2014), these regressions include the following control variables: age, gender, failed comprehension, round, education (7 levels), country (India, other non-US) and study fixed-effects. Standard errors are clustered at the individual level (IP-address). When regressing contributions on log10 of decision times, without controls, no significant association is obtained (OLS regression: coefficient = 0.0377, n = 6830, p = 0.172). Regressing contributions on raw decision times, without controls, also fails to yield any significant association (OLS regression: coefficient < 0.0001, n = 6830, p = 0.749). Standard errors are clustered at the individual level (IP-address). We use OLS regressions as per Rand *et al.* (2014), although Rand *et al.* (2012) present Tobit regressions. Using Tobit instead of OLS does not materially influence results obtained here, or elsewhere.

[7] The positive association is preserved when omitting controls (OLS regression: coefficient = 0.2161, n = 504, p < 0.001). Standard errors are clustered at the individual level (IP-address).

decision time. Doing so yields a non-significant association for decisions made in less than four seconds (OLS regression: coefficient = 0.0166, n = 176, p = 0.781), but a positive and significant association for decisions made in less than five seconds (OLS regression: coefficient = 0.0670, n = 431, p = 0.019). Although, the association between cooperation and log10 of decision time is negative (OLS regression: coefficient = -0.1209, n = 5806, p < 0.001), across the entire sample from cooperation games, the presence of a positive association within the first few seconds prohibits the inference that the former association implies spontaneous cooperation. Moreover, there is no significant association between cooperation and raw decision times (OLS regression: coefficient = -0.0003, n = 5806, p = 0.151) across the same sample. In other words, there is no evidence from this analysis that cooperation is more spontaneous than is non-cooperation.

Figure 2a here

Figure 2b here

Should we instead examine the likelihood that a given response contributes everything to the public good, the case for spontaneous cooperation fares no better. Restricting our analysis again to decisions made in the first few seconds, the likelihood that a given response contributes everything is not associated with decision time for decisions made in less than four seconds (probit regression: coefficient = 0.1713, n = 176, p = 0.477), but increases with decision time for decisions made in less than five seconds (probit regression: coefficient = 0.2216, n = 431, p = 0.027). As with average contribution rates, we find here, too, that the likelihood of contributing everything is negatively associated with decision time when all decision times are included (probit regression: coefficient = -0.0027, n = 5806, p = 0.042) —but the presence of a positive correlation within the first few seconds prohibits the inference that the former correlation implies spontaneous cooperation.[8]

An alternative approach would be to examine the likelihood that a given response equally splits the endowment, contributing half to the public good. However, there is no discernable relationship between decision times and the likelihood of choosing an equal split, neither within the first four seconds (probit regression: coefficient = -0.0127, n = 133, p = 0.969) nor across the entire range of decision times (probit regression: coefficient = 0.0012, n = 5494, p = 0.145).[9]

[8] Again we use the same controls as in Rand *et al.* (2014) and cluster standard errors at the individual level (IP-address).

[9] We use the same controls as in Rand *et al.* (2014) and cluster standard errors at the individual level (IP-address).

Finally, we revisit our original criticism—that the vast majority of allocation decisions in Rand *et al.* (2014) are relatively slow—by considering the one study for which the share of fast decisions was the greatest, namely Study F. Study F is a repeated public good game with random matching, for which median decision times are 2 seconds and 13 seconds in the time pressure and time delay treatments, respectively. 42.64% of the total 720 decisions were recorded at less than four seconds. However, within this range, the association between decision times and cooperation is positive and significant (OLS regression: coefficient = 0.1034, $n = 307$, $p = 0.030$).[10] This would contradict claims that intuition promotes cooperation.[11] It would seem then, that if any conclusion should be drawn from the scarce data on fast decision times in Rand *et al.* (2014), it would be that non-cooperative behavior appears more spontaneous.

5. General Discussion

We have re-examined the data presented by Rand *et al.* (2012) and Rand *et al.* (2014), and we have found no meaningful evidence that cooperative behavior is more spontaneous or "intuitive" than is non-cooperative behavior. Our findings therefore undercut the central message conveyed by the authors in these papers—as well their response to failed replications of their pattern of results (Tinghög *et al*., 2013; Rand *et al*., 2013). A precondition for claiming cooperative behavior is more spontaneous—either on the basis of decision-time manipulations or correlations—is that the data contain a sizeable portion of very fast decisions. One would then have to establish that is the variation in cooperation levels between these and relatively slow decisions that drive time-pressure effects or correlations. The authors do not report the distribution of decisions across decision times, but their high median decision times—which they do report—hint that there would be few fast decisions. This we have proven to be the case. That the vast majority of responses were slow invites the interpretation that they were done under deliberation, and—even if they were not—it would be impossible to discriminate between slow intuitive responses and responses that were deliberative. On the basis of their entire sample, therefore, we would conclude that their data do not permit attributions of cooperative behavior to spontaneous or intuitive processes.

Given the data presented by Rand *et al.* (2014), which allegedly included all the data collected by the research group on this topic, the best possible test for the proposition that cooperative behavior

[10] This regression includes age, round and gender as controls. Failed comprehension was omitted because it was "confirmed orally before game" (Rand *et al.*, 2014, Table 6, p. 11).

[11] Of course, by virtue of its structure, there could be learning across rounds, and we know from past studies that cooperation tends to drop with rounds (e.g., Fischbacher and Gächter, 2010). It might be possible, then—as Rand *et al.* argue in their unpublished response to an earlier version of this paper—that the positive correlation is driven by more reflexively uncooperative behavior in later rounds. However, our result controls for round of play.

is spontaneous would be to examine decisions for those who decided within the first few seconds. Of course, there are problems with interpreting such results, as this selection of the sample represents a minor portion of the overall sample, and because participants may have made their decision while reading the instructions, prior to viewing the decision screen, where the clock starts. However, this analysis would allow us to observe the pattern of responses in a range for which intuition plausibly might give way to deliberation. If, among those who decide fast—say within four or five seconds—decision times were negatively correlated with cooperation, this would be consistent with the proposition that cooperation is spontaneous. However, should instead decision times within this range be positively correlated with cooperation, this would count as evidence against that hypothesis. Indeed, when including responses from the full range of studies presented in Rand *et al.* (2014), we find that decision times, within the first four seconds, are positively associated with cooperation. This result is preserved when we confine the analysis to Study F, which among the 15 studies contains the greatest share of fast decisions. Similarly, within the first five seconds, decision times are positively associated with cooperation when we confine the analysis to one-shot cooperation games. Taken together, these results all speak against the notion that cooperative behavior is intuitive.

More broadly, it is natural to ask what we can learn about cooperation in general from the substantial amount of data—15 studies and 6913 observations—presented in Rand *et al*. (2014). And to do so we should place the studies in some context. In the one-shot public good games, the mean cooperation rate is 60 percent of the total endowment. This is substantially higher than mean cooperation rates commonly reported for such games; typical cooperation rates range between 30 and 40 percent (see e.g., Zelmer, 2003; Chaudhuri, 2011). If we instead consider the proportion of players contributing everything to the public good, we reach similar conclusions. The proportion of players contributing everything in Rand *et al*. (2014) is 39 percent. In contrast, the proportion of players contributing everything in laboratory studies carried out by Kocher *et al*. (2008) is 8, 11, and 17 percent—in the US, Japan, and Austria, respectively.[12] These discrepancies are not surprising in light of the trivial endowment size—40 cents—for all but 211 of Rand *et al.*'s 4655 observations for one-shot public good games. Notably, the mean cooperation rate for the aforementioned 211 observations (from Study D), which involved more substantial endowments (four dollars), is 45 percent. In fact, Amir *et al.* (2012) report that cooperation rates in online hypothetical public good games do not differ from online games with one-dollar endowments; they find that the mean cooperation rate in both cases is 68 percent. Hence, there is reason to think that vast majority of observations for one-shot public good games in Rand *et al.* (2014) may be regarded as virtually non-incentivized. It is ironic that Rand *et al*. (2014) base their claims about cooperation on studies that largely feature trivial stakes—when their very own opening remarks speak of, "Cooperation, where individuals pay costs to benefit others..." (p. 2).

[12] These proportions are not reported in Kocher *et al.* (2008), but can be found in the original data.

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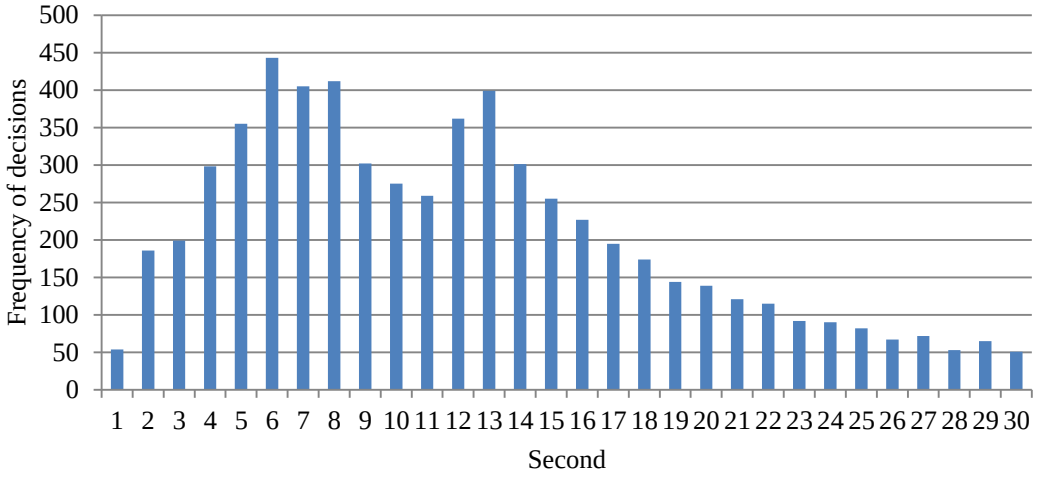
Figures

(1a) Rand *et al*. (2014). Pooled data: all studies



(1b) Rand *et al*. (2014). Pooled data: all studies

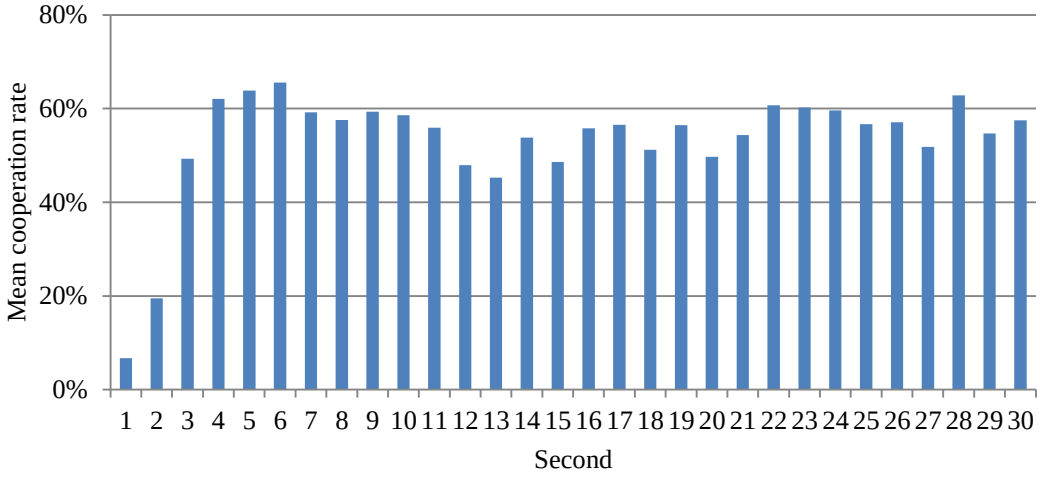
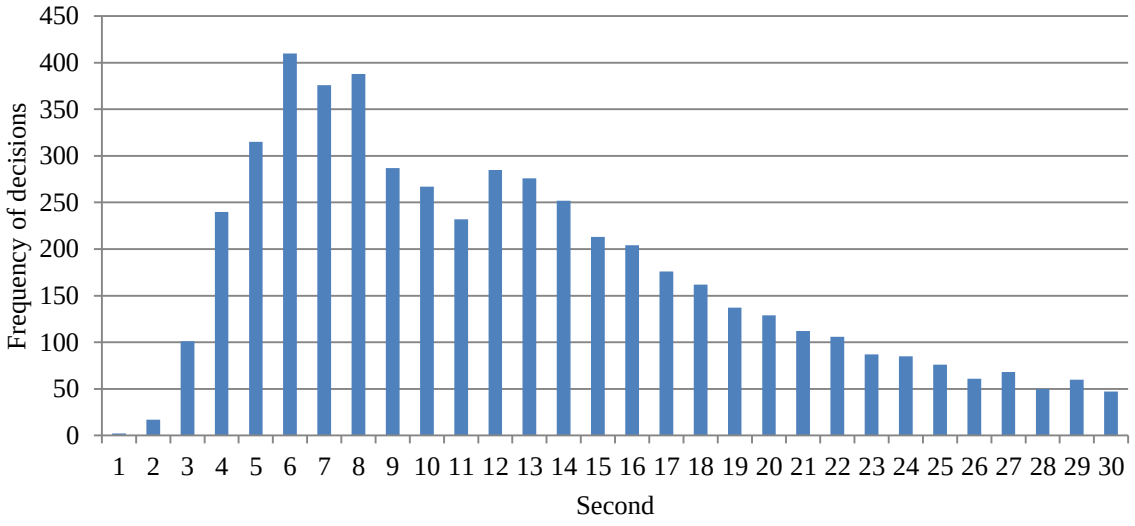


Figure 1 | Few decisions are fast, and within the first four seconds cooperation increases. Decision times are rounded to the nearest whole second, and the horizontal axis is truncated at 30 seconds. (**1a**) Frequency of decisions by second. Median decision time is 12 seconds. (**1b**) Mean cooperation rate by second. Contribution significantly increases during the first few seconds. The figure is based on all decisions for which decision times are available in Rand *et al.* (2014).

(2a) Rand et al. (2014). One-shot cooperation games



(2b) Rand et al. (2014). One-shot cooperation games

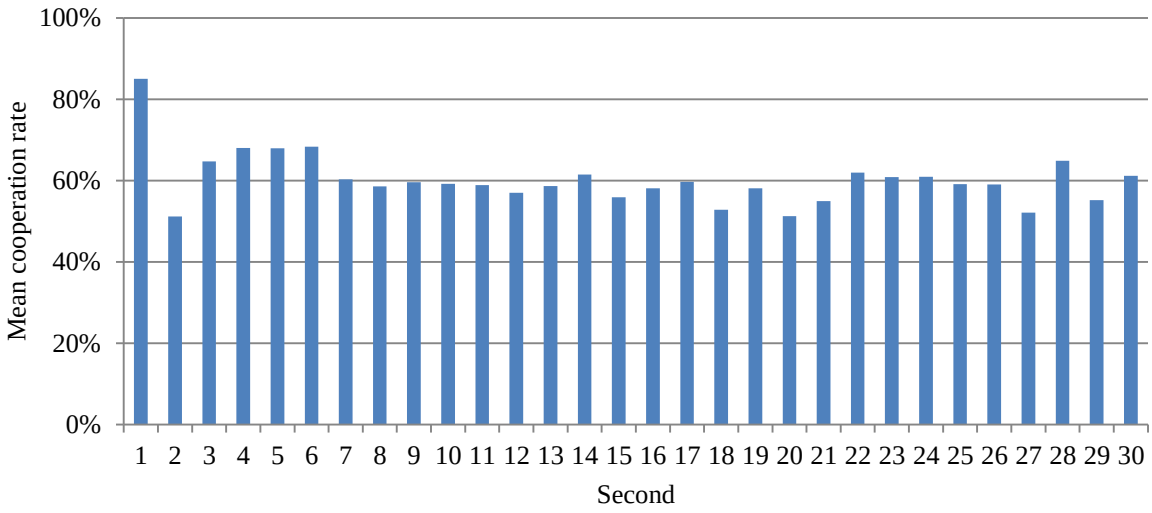


Figure 2 | Few decisions are fast, and there is no clear pattern between mean cooperation rate and decision time. Decision times are rounded to the nearest whole second, and the horizontal axis is truncated at 30 seconds. (**1a**) Frequency of decisions by second for all cooperation games. Median decision time is 13 seconds. (**1b**) Mean cooperation rate by second. The figure is based on all decisions made in one-shot public goods games and prisoners' dilemmas for which data are available in Rand *et al.* (2014).