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Social dilemma cooperation (unlike Dictator Game giving) is intuitive for men as well as women

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ABSTRACT

Does intuition favor prosociality, or does prosocial behavior require deliberative self-control? The Social Heuristics Hypothesis (SHH) stipulates that intuition favors *typically* advantageous behavior – but which behavior is typically advantageous depends on both the individual and the context. For example, non-zero-sum cooperation (e.g. in social dilemmas like the Prisoner's Dilemma) typically pays off because of the opportunity for reciprocity. Conversely, reciprocity does not promote zero-sum cash transfers (e.g. in the Dictator Game, DG). Instead, DG giving can be long-run advantageous because of reputation concerns: social norms often require such behavior of women but not men. Thus, the SHH predicts that intuition will favor social dilemma cooperation regardless of gender, but only favor DG giving among women. Here I present meta-analytic evidence in support of this prediction. In 31 studies examining social dilemma cooperation ($N = 13,447$), I find that promoting intuition increases cooperation to a similar extent for both men and women. This stands in contrast to the results from 22 DG studies (analyzed in Rand et al., 2016) where intuition promotes giving among women but not men. Furthermore, I show using meta-regression that the interaction between gender and intuition is significantly larger in the DG compared to the cooperation games. Thus, I find clear evidence that the role of intuition and deliberation varies across both setting and individual as predicted by the SHH.

1. Introduction

Humans regularly help others, even when doing so is personally costly. Such prosocial behavior is central to the success of human societies. Therefore, explaining why people are willing to incur such costs is a central question in social psychology. In recent years, there has been considerable interest in understanding the underpinnings of prosociality from a dual-process perspective (for a review, see Zaki & Mitchell (2013)). Dual-process models conceptualize decisions as arising from the interaction of cognitive processes that are relatively automatic, intuitive, and effortless, and cognitive processes that are relatively controlled, deliberative, and effortful (Gilovich, Griffin, & Kahneman, 2002; Sloman, 1996).

The Social Heuristics Hypothesis (SHH, Rand et al., 2014) has been proposed as a theoretical framework for understanding prosociality from a dual-process perspective. The SHH proposes that (i) intuition favors behaviors which are typically long-run payoff-maximizing, while (ii) deliberation leads to the behavior which is payoff-maximizing in the current situation. Of particular interest is “pure” prosociality in one-shot anonymous interactions (or, more broadly, interactions where future consequences are insufficient to outweigh the costs of being

prosocial). Here, it is always self-interested to act selfishly, and thus deliberation is predicted to favor selfishness in these settings. Generating predictions regarding intuition, on the other hand, requires understanding which behaviors are optimal in more *typical* scenarios that involve future consequences – consequences created by, for example, repeated interactions (Trivers, 1971), reputation effects (Nowak & Sigmund, 2005), or the threat of sanctions (Fehr & Gächter, 2002); for a review see Rand & Nowak (2013).

Which behavior is predicted to be favored by intuition, therefore, may vary across situations and across individuals (based on which behavior is typically advantageous for a given individual in a given situation). Here, we consider the interaction between two forms of such variation. With respect to situational factors, we consider differences in typically advantageous behavior between situations that involve multi-lateral non-zero-sum cooperation (i.e. social dilemmas such as the Prisoner's Dilemma) versus unilateral zero-sum transfers (i.e. giving in the Dictator Game, sometimes referred to as behavioral “altruism” (Rand, Brescoll, Everett, Capraro, & Barcelo, 2016)). With respect to individual differences, we consider differences in typically advantageous behavior between men and women.

Because social dilemma cooperation involves non-zero-sum

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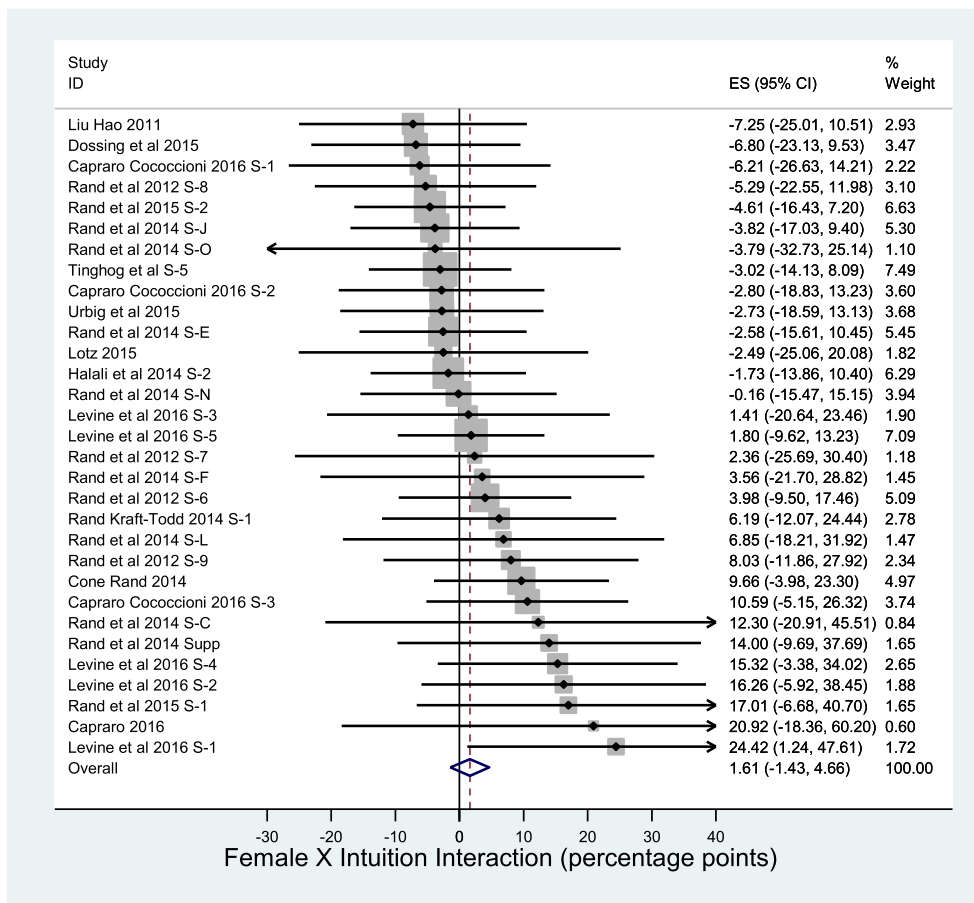


Fig. 1. Effect size (i.e. raw regression coefficient) for interaction between gender (0 = male, 1 = female) and cognitive processing mode (0 = more deliberative, 1 = more intuitive) for each social dilemma cooperation experiment. Error bars indicate 95% confidence intervals. Gray squares indicate weight placed on each study by random effects meta-analysis.

interactions, it can be payoff-maximizing to cooperate because of the chance for repeated interactions: If my cooperating with you today makes you more likely to cooperate with me tomorrow, reciprocity can lead long-run self-interest to favor cooperation (Fudenberg & Maskin, 1986). As a result, the SHH predicts that intuition should typically favor cooperation. This prediction is demonstrated formally by a mathematical model showing that, when repeated interactions are sufficiently common, strategies which intuitively cooperate and then use deliberation to switch to defection when in 1-shot anonymous settings are favored by evolution, learning, and strategic reasoning (Bear, Kagan, & Rand, 2017; Bear & Rand, 2016). The power of reciprocity to incentivize cooperation is a basic feature of social interaction, and thus its force does not vary based on gender. As a result, the SHH predicts that gender will *not* moderate the relationship between intuition and cooperation.

The situation is different, however, for Dictator Game giving. Because this form of giving is zero-sum, repetition does not create an incentive to give – giving money to someone and having them give it back to you makes you no better off than if you had just kept all the money in the first place. Thus, the only way that altruistic giving can be long-run payoff-maximizing is inasmuch as giving is perceived positively (and/or not giving is perceived negatively) by others, and thereby influences their actions towards the altruistic giver in future non-zero-sum interactions.

Critically, a large literature on gender norms indicates that women are expected to be (and disproportionately occupy roles that mandate being) communal and unselfish (i.e. altruistic), whereas men are expected to be (and often occupy roles that benefit from being) agentic and independent (Eagly, 1987; Heilman & Okimoto, 2007). Thus, women experience reputational benefits from unilateral giving (and sanctions for not giving) much more so than men, such that unilateral

giving may typically be long-run payoff maximizing – and thus favored by intuition – for women but not men. As a result, in contrast to social dilemma cooperation, the SHH leads to the prediction that gender is likely to be a moderator of the relationship between intuition and DG giving (see Supplementary materials Section 1 for further discussion of gender and social dilemma cooperation).

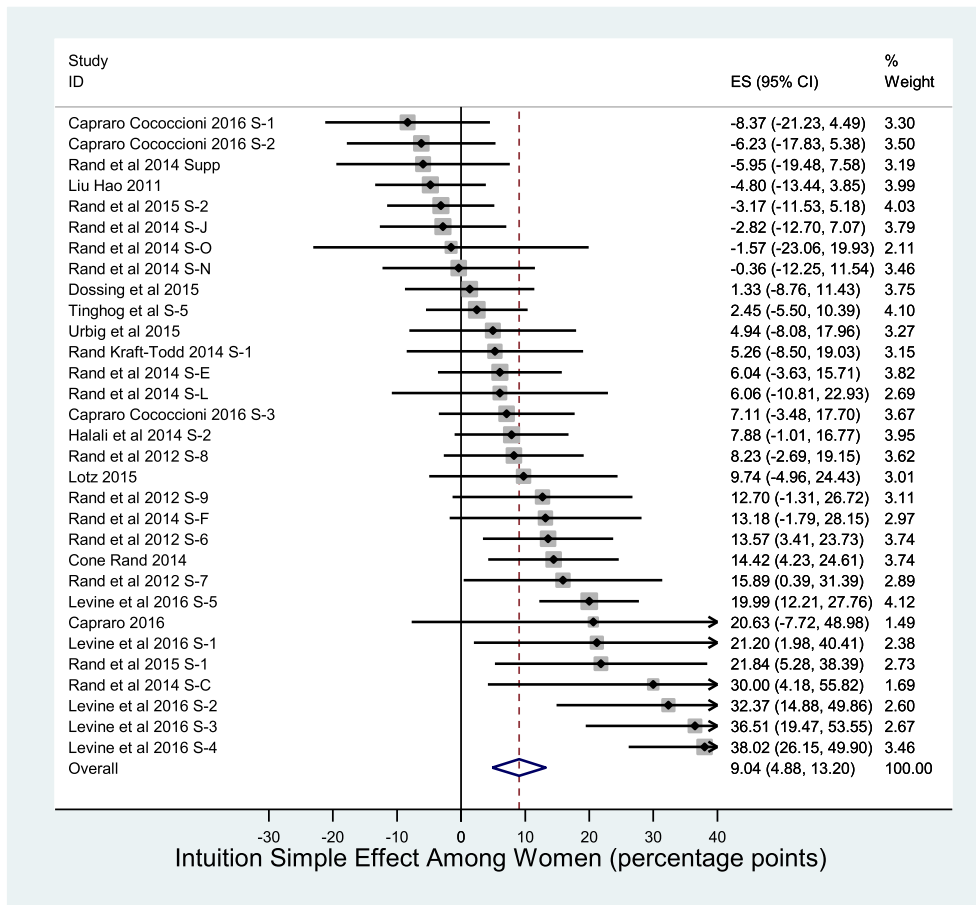
Consistent with this prediction regarding DG giving, Study 1 from Rand et al. (Rand et al., 2016) (hereafter RBECB) presented a meta-analysis of 22 experiments which showed that promoting intuition led to more DG giving relative to promoting deliberation among women, but had no significant effect among men. Furthermore, Study 2 showed that this relationship was moderated by self-identification with sex roles, such that women consistently gave more than men when intuition was promoted, but when deliberation was promoted, women who more strongly identified with traditionally masculine attributes (e.g. dominance, independence) reduced their giving (i.e. gave amounts similar to what was given by men).

However, the SHH prediction regarding a lack of interaction between gender and intuition in social dilemma cooperation has yet to be tested. Here, I evaluate this prediction using meta-analysis of 1-shot incentivized economic game experiments involving social dilemma cooperation in which the use of intuition versus deliberation was experimentally manipulated. I then compare the moderating role of gender in these cooperation decisions versus giving decisions in the DG using meta-regression.

2. Method

I take advantage of a dataset collected for a recent meta-analysis of cognitive processing and cooperation (Rand, 2016) which did not explore gender. This dataset included 51 studies involving social dilemma

Fig. 2. Effect size on social dilemma cooperation of promoting intuition among women for each experiment. Error bars indicate 95% confidence intervals. Gray squares indicate weight placed on each study by random effects meta-analysis.



cooperation (referred to as “pure” cooperation in Rand (2016)): 1-shot anonymous games in which it is always payoff-maximizing to not cooperate, but where it could be payoff-maximizing to cooperate if the game had been repeated. Specifically, this included decisions in the 1-shot Prisoner’s Dilemma, Public Goods Game, and Trust Game player two (“trustee” – cooperating can be payoff-maximizing for player one in the Trust Game, and so is not included). In these experiments, cognitive processing mode was manipulated via time constraints (intuition increased by applying time pressure, deliberation increased by applying time delay), cognitive load (intuition increased by having participants complete a cognitively demanding task while playing the game), ego depletion (intuition increased by having participants complete a cognitively demanding task prior to playing the game), and intuition inductions (intuition increased by writing about a time in one’s life when intuition worked well/careful reasoning worked poorly or being directly instructed to use intuition/deliberation increased by writing about a time in one’s life when intuition worked poorly/deliberation worked well or being directly instructed to deliberate). Importantly, there were no indications of publication bias in this dataset, using either small-study effect tests (Egger’s or Begg’s test) or using the p-curve test for “p-hacking” (Simonsohn, Nelson, & Simmons, 2014), and there is no danger of publication bias regarding the gender-related questions considered in the current paper, since none of the original papers from which the data came analyzed gender or the interaction between gender and cognitive processing. For further details about the construction of the underlying dataset, see Rand (2016).

I had access to raw data with gender information for 31 of the social dilemma studies from Rand (2016), with combined N = 13,447 (these 31 studies contained 84.8% of the total N in Rand (2016); see Supplementary materials Table S1 for study list and details). I take percentage of the endowment spent on cooperating as my measure of

cooperation. I code gender as 0 = male, 1 = female, and code cognitive processing manipulations as 0 = more deliberative condition, 1 = more intuitive condition. All main effects, interactions, and simple effects are calculated using linear regressions taking cooperation as the dependent variable and the appropriate combination of these gender and cognitive processing variables as independent variables. As in Rand (2016), my main analyses exclude participants who were non-compliant with the cognitive processes manipulations (i.e. did not answer quickly enough in the time pressure condition, answered too quickly in the time delay condition, or did not write long enough responses in the recall induction), but I also include secondary analyses including all participants (an intent-to-treat analysis) to ensure that any results observed are not driven by selection effects (for extended discussion of selection effects and non-compliance, see Bouwmeester et al. (2017); Rand (2017)).

All analyses consider the overall effect across all studies using random effects meta-analysis implemented using the *metan* function in Stata/SE 14.2, which uses the standard DerSimonian & Laird method to estimate between studies variance. See Supplementary materials Section 2 for analysis of heterogeneity in effect size across studies.

3. Results

Random effects meta-analysis finds a significant main effect of cognitive processing manipulation, such that participants in the more intuitive condition spent 8.2 percentage points (95% CI [4.9, 11.4], Z = 4.97, p < 0.0001) more of their endowment on cooperation than participants in the more deliberative condition (including non-compliance participants, effect size 5.9 percentage points, 95% CI [2.9, 9.0], Z = 3.83, p = 0.0001); and a significant main effect of gender, such that women spent 3.7 percentage points (95% CI [2.2, 5.2],

Fig. 3. Effect size on social dilemma cooperation of promoting intuition among men for each experiment. Error bars indicate 95% confidence intervals. Gray squares indicate weight placed on each study by random effects meta-analysis.

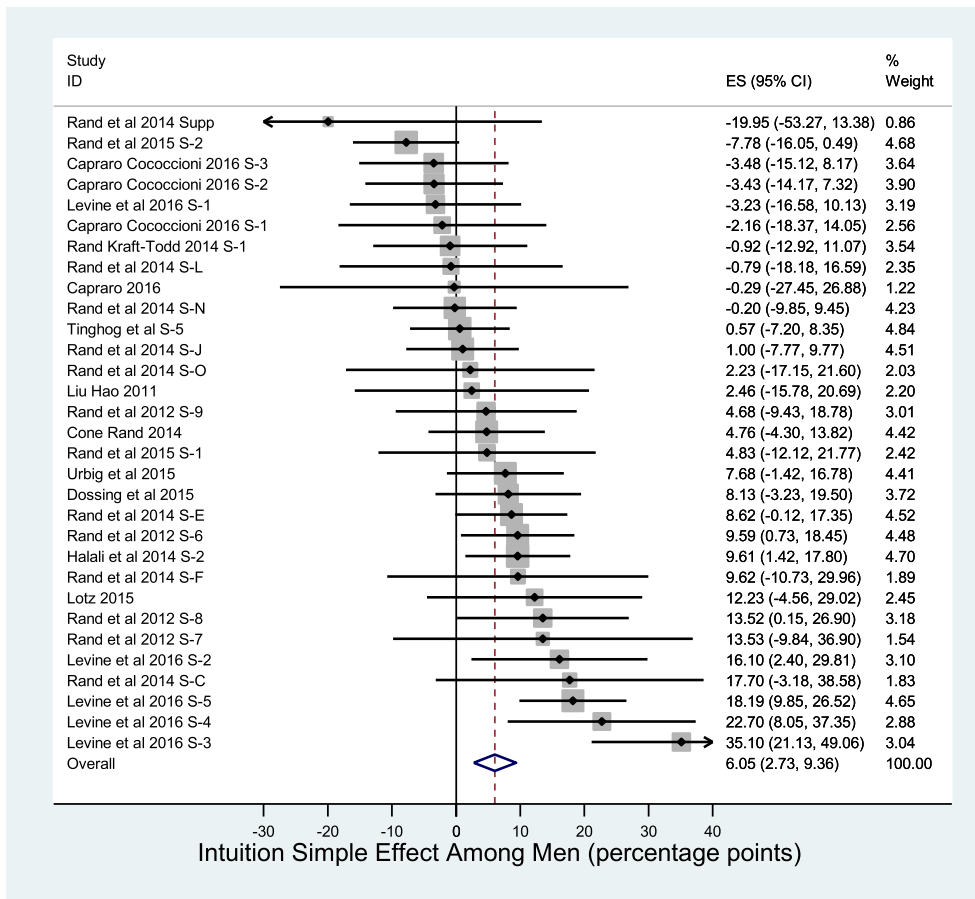


Fig. 4. Effect size of promoting intuition on social dilemma cooperation versus DG giving for men versus women. Error bars indicate 95% confidence intervals.

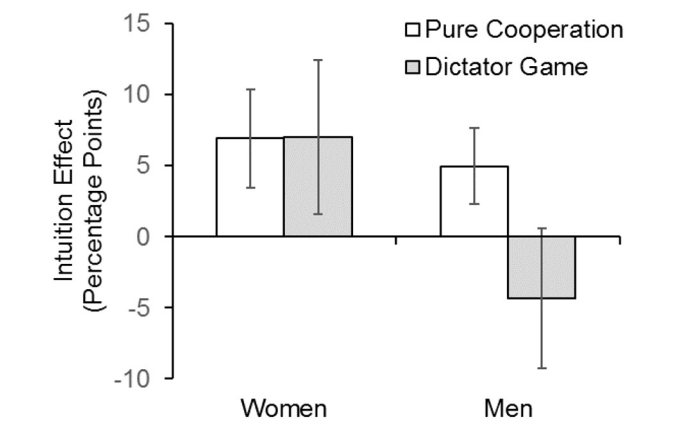


Fig. 4. Effect size of promoting intuition on social dilemma cooperation versus DG giving for men versus women. Error bars indicate 95% confidence intervals.

Z = 4.88, $p < 0.0001$) more than men (including non-compliance participants, effect size 3.5 percentage points, 95% CI [2.1, 4.8], Z = 4.93, $p < 0.0001$).

Critically, as predicted, random effects meta-analysis did not find a significant interaction between gender and promoting intuition, interaction effect size 1.6 percentage points, 95% CI [-1.4, 4.7], Z = 1.04, $p = 0.29$ (Fig. 1) (including non-compliant participants, interaction effect size 1.1 percentage points, 95% CI [-1.6, 3.9], Z = 0.80, $p = 0.43$). Instead, there is a roughly equally sized positive effect of intuition on cooperation among women, effect size 9.0 percentage points, 95% CI [4.9, 13.2], Z = 4.26, $p < 0.0001$ (Fig. 2) (including non-compliant participants, effect size 7.1 percentage points, 95% CI [3.3, 10.8], Z = 3.69, $p < 0.0001$); and among men, effect size 6.2 percentage points, 95% CI [2.7, 9.4], Z = 3.57, $p < 0.0001$ (Fig. 3)

(including non-compliant participants, effect size 5.0 percentage points, 95% CI [2.2, 7.8], Z = 3.45, $p = 0.001$). Thus, in contrast to the results observed for DG giving in RBECB, I find that intuition promotes social dilemma cooperation among men and women to a similar extent. (Although strategic cooperation is not the focus of the current paper, there is also no interaction between gender and intuition in strategic cooperation games; see Supplemental materials Section 3.)

To show that this difference in gender interaction effect sizes is itself significant, I use random effects meta-regression on the combined dataset of the 31 social dilemma cooperation studies analyzed here and the 22 DG studies analyzed in RBECB.

In order to compare prosociality levels across the different types of games, I follow the normalization procedure of Peysakhovich, Nowak, & Rand (2014), whereby giving 50% of the endowment in the DG is “as cooperative” as contributing 100% of the endowment in the cooperation games (i.e. I multiply DG giving values by 2). The logic behind this renormalization is that the normative (and socially optimal) action in the DG is to give half – thus giving half in the DG corresponds to being maximally prosocial, like contributing everything in a Public Goods Game. However, my results are not contingent on this normalization – see Supplementary materials Section 4 for details.

Furthermore, I use cooperation game interaction effect sizes including non-compliant participants (i.e. using the more conservative intent-to-treat analysis), because non-compliant participants were included in the effect sizes calculated in RBECB (although all meta-regression results reach equivalent levels of significance if non-compliant participants are excluded from the cooperation data).

Random effects meta-regression shows that the gender-intuition interaction effect size was significantly larger in the DG studies compared to the cooperation studies (9.9 percentage points larger, $t = 2.99$, $p = 0.004$). Decomposing the interaction by gender (Fig. 4), I find that, among men, the intuition effect was significantly smaller in

the DG compared to the cooperation games (9.3 percentage points smaller, $t = -3.26$, $p = 0.002$); among women, conversely, there was no significant difference in intuition effect size between the DG and the cooperation games (0.1 percentage points difference, $t = 0.02$, $p = 0.99$).

Furthermore, these results are all robust to excluding the 20 studies that used time constraints (10.4 percentage point larger gender-intuition interaction effect in the DG, $t = 2.60$, $p = 0.014$; among men, 12.8 percentage point smaller intuition effect in the DG, $t = -3.12$, $p = 0.004$; among women, 1.8 percentage point smaller intuition effect in the DG, $t = -0.39$, $p = 0.70$). This is important because a much larger fraction of the cooperation studies used time constraints compared to the DG studies, and RBECB found some suggestive (although non-significant) evidence that there was less of a gender interaction among time constraint studies.

4. Discussion

Here I have presented meta-analytic evidence that intuition favors prosociality for women regardless of whether there is a potential for mutual benefit, whereas intuition only favors prosociality for men in the context of social dilemma cooperation (where such a mutual benefit is possible) and not DG giving (which is zero-sum). Taken together, these findings validate the moderation predictions of the SHH. My results also relate to the observation that there are consistent gender differences in DG giving but not cooperation (Croson & Gneezy, 2009), and help to elucidate the cognitive basis for differences in gender effects across games (although in contrast to the conclusions of Croson and Gneezy (2009), I do find a significant, albeit small, main effect of women cooperating more in social dilemmas).

The lack of interaction between gender and intuition for social dilemma cooperation reported here is at odds with the results of (Espinosa & Kovářík, 2015), who analyzed a small subset of the data I consider here (2 of the 31 studies included in my analysis) and did find gender moderation. The fact that no such moderation effect emerges from the much larger dataset used here suggests that their earlier finding was spurious, and highlights the importance of meta-analysis and large multi-lab datasets, particularly when examining interaction effects. I also note that Registered Replication Report of Bouwmeester et al. (2017) found no interaction between time pressure and gender when predicting social dilemma cooperation (although collapsing across genders, they only found a main effect of time pressure when excluding non-compliant participants; see Rand (2017) for further discussion).

Finally, the results reported here suggest that, despite within-individual correlations between dictator game giving and social dilemma cooperation (Capraro, Jordan, & Rand, 2014; Peysakhovich et al., 2014; Yamagishi et al., 2013) and the ability of habituating to cooperation vs defection to influence subsequent dictator game giving (Peysakhovich & Rand, 2016; Stagnaro, Arechar, & Rand, 2017), there are fundamental differences in the cognition and daily-life forces that shape altruism versus cooperation. Further empirical exploration of, and theoretical development regarding, these differences is an important direction for future work on prosociality.

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Appendix A. Supplementary materials

Supplementary analyses for this article can be found online at <http://dx.doi.org/10.1016/j.jesp.2017.06.013>.

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Supplementary Materials

for

Social dilemma cooperation (unlike Dictator Game giving) is intuitive for men as well as women

David G. Rand

1. Theoretical justification for lack of gender interaction in social dilemma cooperation

In the main text, I argue that social dilemma cooperation should be intuitive for both men and women because reciprocity concerns apply to both genders, whereas DG giving should only be intuitive for women because social norms require only women to give. But social norms requiring women to be communal may also motivate cooperation for women as well as DG giving. This would mean that cooperation is doubly advantageous in daily life for women (both reciprocity concerns and gender norms prescribe cooperation) – and given this, one might imagine that women’s intuitions should favor even more cooperation than men (for whom the reciprocity concerns apply but the gender norms don’t).

However, prosocial behavior in economic games is, in general, discrete rather than continuous: a large majority of subjects in the cooperation games contribute either nothing or everything; and a large majority of subjects in the Dictator games give either nothing or half. Thus, most subjects are choosing between keeping everything (the maximally selfish option) and giving the normative option (100% in cooperation, 50% in dictator), rather than making a decision about *how much* to give. Therefore, in cooperation games, reciprocity concerns mandate 100% contribution for men, leading their intuitive response to be 100% contribution; and both reciprocity concerns and gender norms mandate 100% contribution for women, also leading to their intuitive response being 100% contribution. That is, because both reciprocity concerns and social norms agree on what the optimal behavior is for women, there is not an additive effect – and as a result, there is no interaction between gender and intuition for social dilemma cooperation.

2. Heterogeneity in effect size across social dilemma cooperation studies

There was no significant variation across studies in effect size for the main effect of gender, $I^2=0\%$, $\chi^2(30)=28.2$, $p=.56$, or the gender-intuition interaction $I^2=0\%$, $\chi^2(30)=22.1$, $p=.85$. There was, however, significant heterogeneity in effect size across studies for the impact of cognitive processing on social dilemma cooperation, both for the main effect, $I^2=77.1\%$, $\chi^2(30)=130.8$, $p<.001$, and the simple effect among women, $I^2=72.0\%$, $\chi^2(30)=107.2$, $p<.001$, and simple effect among men, $I^2=54.4\%$, $\chi^2(30)=65.8$, $p<.001$. This heterogeneity is not surprising, given the range of different cognitive processing manipulations and game types included in the study. While there are not enough studies in the current dataset to investigate the nature of this variation in greater detail, see Rand 2016 for further discussion of this topic.

3. Strategic cooperation

Although in this paper I focus on pure cooperation in social dilemma, Rand (2016) also examined *strategic* cooperation in settings where cooperating can be payoff maximizing – and thus where the SHH predicts that deliberation will not reduce cooperation (for either men or women). Gender data was available for 1186 of the 2220 strategic cooperation subjects in Rand (2016). As predicted, meta-analyzing these subjects found no significant interaction between gender and intuitive processing, -0.2 percentage points, 95% CI [-10.4, 10.1], $Z=.03$, $p=.98$ (including non-compliant participants, interaction effect size -1.8 percentage points, 95% CI [-10.4, 6.8], $Z=.43$, $p=.68$). Instead, that there was no significant intuition effect among either men or women (with or without non-compliant participants; $p>.25$ for all).

4. Results without normalizing Dictator Game giving

The meta-regression results comparing social dilemma cooperation and dictator game giving presented in the main text do not rely on the normalization whereby all DG giving amounts were doubled. Results are qualitatively equivalent without normalizing DG giving: there is a significantly larger gender-intuition interaction effect size in the DG studies compared to the cooperation studies (4.4 percentage points larger, $t=2.14$, $p=.037$); a significantly smaller intuition effect in the DG compared to the cooperation games among men (7.1 percentage points smaller, $t=-3.71$, $p=.001$); and no significant difference in intuition effect between DG and cooperation among women (-3.4 percentage points difference, $t=-1.36$, $p=.18$).

Table S1. Description of the social cooperation studies included in the meta-analysis.

Study	Cognitive Process Manipulation	Game	N	N including non-compliant participants	Notes
Capraro (2016)	Time Constraints	Continuous PD	101	207	
Capraro and Cococcioni (2016) S-1	Ego Depletion	Continuous PD	291	291	Depletion = crossing out “e”s except when 1 letter away from other vowel
Capraro and Cococcioni (2016) S-2	Ego Depletion	Continuous PD	403	403	Depletion = Stroop task
Capraro and Cococcioni (2016) S-3	Ego Depletion	Continuous PD	459	459	Depletion = required to give wrong answer to easy questions
Cone and Rand (2014)	Time Constraints	PGG	536	751	Secondary manipulation: framed neutrally or as competition
Døssing et al. (2015)	Cognitive Load	PGG	166	166	10 period PGG with random matching (no future consequences in any period)
Halali et al. (2014) S-2	Ego Depletion	TG P2	74	80	
Levine et al. (2016) S-1	Intuition Induction	PD	301	301	Recall induction
Levine et al. (2016) S-2	Intuition Induction	PD	290	290	Instructed to decide using heart versus head
Levine et al. (2016) S-3	Intuition Induction	PD	293	293	
Levine et al. (2016) S-4	Intuition Induction	PD	405	405	
Levine et al. (2016) S-5	Intuition Induction	PD	692	692	Instructed to decide using emotion versus reason
Liu and Hao (2011)	Intuition Induction & Cognitive Load	PD	120	120	Recall induction combined with remembering simple or complex 8 digit number
Lotz (2015)	Intuition Induction	PGG	217	246	Recall induction. Secondary manipulation: large vs small share of public good
Rand et al. (2012) S-6	Time Constraints	PGG	417	680	
Rand et al. (2012) S-7	Time Constraints	PGG	151	211	
Rand et al. (2012) S-8	Intuition Induction	PGG	343	864	Recall induction

Rand et al. (2012) S-9	Intuition Induction	PGG	256	696	Recall induction
Rand et al. (2014) S-C	Time Constraints	PD	220	316	
Rand et al. (2014) S-E	Time Constraints	PGG	570	801	Secondary manipulation: framed neutrally, as “community game”, or as “profit game”
Rand et al. (2014) S-F	Time Constraints	PGG	48	48	15 period PGG with random matching (no future consequences in any period); if participant took too long, random contribution selected
Rand et al. (2014) S-J	Time Constraints	Continuous PD	587	666	Secondary manipulation: in-group vs out-group partner
Rand et al. (2014) S-L	Time Constraints	PGG	144	150	Answered comprehension questions before PGG
Rand et al. (2014) S-N	Time Constraints	PGG	546	603	Secondary manipulation: implementation of time delay
Rand et al. (2014) S-O	Time Constraints	PGG	155	163	
Rand et al. (2014) S-Supp	Time Constraints	PGG	246	279	PGG framed as extraction
Rand et al. (2015) S-1	Time Constraints	Continuous PD	185	210	Secondary manipulation: in-group vs out-group partner
Rand et al. (2015) S-2	Time Constraints	PGG	879	1152	Secondary manipulation: framed neutrally or as competition
Rand and Kraft-Todd (2014) S-1	Time Constraints	PGG	445	479	
Tinghög et al. (2013) S-5	Time Constraints	PGG	754		Data was not collected from the 6% of participants who disobeyed time constraints. Tinghög et al. (2013)
Urbig et al. (2015)	Intuition Induction	PGG	276	288	Instructions given in native language (Dutch; control) versus foreign language (English; inducing more deliberation)