Judgment and Decision Making, Vol. 17, No. 1, January 2022, pp. 1–13

Affect and prosocial behavior: The role of decision mode and individual processing style

Manja Gärtner* David Andersson† Daniel Västfjäll‡

Gustav Tinghög§

Abstract

We study the effects of experimental manipulation of decision mode (rational "brain" vs. affective "heart") and individual difference in processing styles (intuition vs. deliberation) on prosocial behavior. In a survey experiment with a diverse sample of the Swedish population (n = 1,828), we elicited the individuals' processing style and we experimentally manipulated reliance on affect or reason, regardless of subjects' preferred mode. Prosocial behavior was measured across a series of commonly used and incentivized games (prisoner's dilemma game, public goods game, trust game, dictator game). Our results show that prosocial behavior increased for the affective ("heart") decision mode. Further, individual differences in processing style did not predict prosocial behavior and did not interact with the experimental manipulation.

Keywords: prosocial behavior; intuition; affect; reason; experiment

1 Introduction

When and why do humans act prosocially? The answer to this question is key to understand much of human behavior and integral for finding solutions to many of the challenges we

*German Institute for Economic Research (DIW Berlin), Germany. ORCID: 0000-0002-7007-9661.

†Linköping University, Sweden.

‡Linköping University, Sweden. ORCID: 0000-0003-2873-4500.

§Corresponding author. Linköping University, Sweden. ORCID: 0000-0002-8159-124. Email: gustav.tinghog@liu.se.

Experimental instructions, data and code are available at: https://osf.io/6s83n/.

Financial support by Marianne and Marcus Wallenberg foundation (grant number MMW 2014.0187) and Deutsche Forschungsgemeinschaft through CRC TRR 190 (project number 280092119) is gratefully acknowledged. An earlier version of this paper was circulated under the title "Inducing cooperation with emotion – who is affected?" and can be found as a working paper in Gärtner et al. (2020). Discussions and comments from seminar participants at the JEDI lab, ESA Berlin 2018, SABE/IAREP 2018, and the CRC TRR 190 workshop in Berlin 2019 are also gratefully acknowledged.

face globally. The hypothesis that intuition promotes cooperation has attracted considerable interest across disciplines (Rand et al. 2012; Tinghög et al. 2013; Krajbich et al. 2015; Mishkowski et al. 2016; Alós-Ferrer et al. 2020; Isler et al. 2021). According to this notion, a first, intuitive response to social dilemmas is linked to prosocial behavior, while reason and deliberation is linked to self-interest. The empirical evidence in support of this Social Heuistics Hypothesis is mixed (Rand et al. 2014; Bouwmeester et al. 2017) and recent meta-analyses have revealed considerable between-study heterogeneity depending on the type of manipulation that is used to induce intuition (Rand 2016; Kvarven et al. 2020). Accordingly, intervening in decision processing by directly asking people to either rely on affect or reason seems to be an effective way to alter cooperation in social dilemmas, while time pressure and cognitive load do not seem to systematically affect prosocial behavior.

Individuals also exhibit individual differences in how much they prefer to rely on intuition (i.e., spontaneous, affect-based) and deliberation (i.e., effortful, planned, and analytical) when making decisions. Such individual differences describe a disposition of the individual (Allport & Odbert 1936; Spielberger & Sydeman 1994) and can interact with exogenously induced states (Block 2005; Hammond et al. 1987; Betsch & Kunz 2008). Interactions between individuals' personal processing style and the decision mode favored by the situation has so far received little attention in the literature on dual-processes. (See Capraro, 2019, for a review of the experimental dual-process literature). The present paper provides an experimental test of how decision mode and individual differences in processing styles jointly affect prosocial behavior in a range of incentivized social dilemmas using a large, diverse sample of the Swedish population.

Our experiment randomized individuals into one of three treatments. We chose to implement the intervention producing the largest, positive effect on cooperation as reported in meta-studies (Rand 2016; Kvarven et al. 2020), which was to induce affect and reason using a direct instructions intervention (Levine et al. 2018; Horstmann et al. 2010; Capraro & Barcelo 2021). Accordingly, our treatments either directly instructed subjects to rely on either affect or reason when making decisions or provided no such instructions (baseline condition). Individual differences in processing styles were measured with the Unified Scale to Assess Individual Differences in Intuition and Deliberation (USID, Pachur & Spaar 2015). Prosocial behavior was measured for each subject with a set of incentivized social dilemmas, including the prisoner's dilemma game, public goods game, trust game, dictator game, and charitable giving. Thus, we, first, provide a test of whether the causal effects of affect- and reason-inducing treatments on cooperation (Levine et al. 2018) generalize to a more comprehensive, cross-game measure of prosocial behavior. Second, we provide a test of the relation between the individuals' preferred processing style and prosocial behavior. Third, manipulating decision mode and measuring individual differences in processing styles allowed us to ask whether the causal effects of inducing affect and reason on prosocial behavior vary across individuals with intuitive and deliberative processing styles.

https://doi.org/10.1017/S1930297500008998 Published online by Cambridge University Press

2 Method

2.1 Subjects and Procedure

A survey experiment programmed in Qualtrics was sent to a diverse sample of the Swedish population above 18 years old through the survey company CMA Research in April and May of 2017.[1] The company collects data from their nation-wide panel of about 20,000 adults who were selected to be representative of the Swedish population in terms of socio-demographic characteristics. Quota sampling was provided to make sure that the recruited sample had approximately the same proportion of individuals in terms of different age groups, gender, and geographical regions as the general Swedish population. Data were collected until our pre-paid sample of 1800 complete survey responses was reached. Attrition from the survey was 20.6%. Overall, we have data of 1,828 individuals (mean age: 47.3; 51.6% females), after excluding subjects with incomplete responses and missing values in key variables.[2] Our sample of about 600 subjects per treatment allows us to detect the full size of the main effect reported in Levine et al. (2018) with more than 99 percent power and up-to small interaction effects with at least 80 percent power.[3]

2.2 Experimental design

We designed an online survey that allows us to identify the causal effect of affect and reason decision modes on prosocial behavior across different decision-making styles in a between-subject design. Subjects were randomized into one of three treatments, a baseline treatment and two others, which induced subjects to make their decisions based on affect or reason using a direct instructions intervention (Horstmann et al. 2010). Based on the wording in Levine et al. (2018, study 3), the *affect treatment* instructed subjects to rely on their emotions (but not their reason) when making their choices in the games, while the *reason treatment* instructed subjects to rely on their reason (but not their emotions). Subjects in the affect [reason] treatment read the following;

Sometimes people make decisions by using reason and relying on their brains. Other times, people make decisions by using emotion and relying on their hearts.

Many people believe that the heart [brain] is the part of our body that is most connected with good decision-making. When we feel with our hearts [think with our brains], rather than think with our brains [feel with our hearts], we make emotionally [rationally] satisfying decisions.

In this part of the experiment, ***please make your decisions by relying on your heart [brain],*** *rather than your brain [heart].*

[1] Data from the same data collection are also described and analyzed in Gärtner et al. (2019; 2020).

[2] We focus here on the analysis on subjects who completed the full survey. The substantive results are the same if all subjects are included.

[3] These estimates are based on Models 2a and 3a of Experiment 3 reported in Levine et al. (2018), from which we derive Cohen's $d = 0.45$, and assuming $\alpha = 0.05$.

https://doi.org/10.1017/S1930297500008998 Published online by Cambridge University Press

The last sentence of the instructions was repeated for each game. The *baseline treatment* gave no additional instructions. Subjects in this condition could follow their "regular" decision mode.

We conducted a number of manipulation checks to corroborate whether the instructions actually affected the decision mode during the experiment. Four questions elicited how subjects themselves judged their decision mode during the experiment, asking them to rate on 5-point Likert scales how much they relied on deliberation, intuition, and emotions as well as how much the instructions made them think more about their decisions. In addition, we tested the effect of instructions on the likelihood with which subjects choose the dominated option in the jellybean task (Denes-Raj & Epstein 1994; Kirkpatrick & Epstein 1992; Peters et al. 2006). Responses in the jellybean task has previously been associated with deliberative and intuitive decision processing. The task involves a hypothetical decision between two bowls containing 100 and 10 jellybeans respectively. Subjects are asked to imagine that they can draw one jellybean from one of the bowls, hidden behind a screen. If they draw a colored jellybean, they win a prize. The two bowls are depicted graphically with a label below the large bowl saying "9% colored jellybeans" and below the small bowl saying "10% colored jellybeans". The rational choice is to choose the small bowl because this maximizes the chances of drawing a colored jellybean, as the small bowl contains more colored jellybeans in percentage terms. However, the intuitive choice is to choose the large bowl as it contains a higher number of colored jellybeans.

Measures of prosocial behavior Prosocial behavior was elicited within-subject in a series of incentivized choices presented in random order: Cooperation in the prisoner's dilemma game (PDG), cooperation in the public goods game (PGG), trust and trustworthiness in the trust game, giving in the dictator game played with another individual (DG) and giving in the dictator game played with a charitable organization (DG charity). Table 1 gives an overview of the social dilemmas used to measure prosocial behavior.

The *PDG* followed the instructions and trade-offs in payoffs used in Levine et al. (2018). Subjects were paired with another, randomly chosen subject. Each subject was endowed with 30 SEK (about $3.4) and subjects simultaneously chose to either keep or transfer their endowment to the other subject. Transferred money was multiplied by two. Subjects received the money they chose to keep plus twice the money that was transferred to them by the other subject.

The *PGG* followed the instructions and trade-offs in payoffs used in Rand et al. (2012). Four randomly grouped subjects simultaneously chose to either keep their endowment of 40 SEK (about $4.6) or to give it to the group. Contributions were pooled, multiplied by two, and equally distributed among all members of the group. Thus, subjects received the amount they kept, and one-fourth of the money pooled in their group.

Our measure of *trust* behavior was a sequential version of the PDG, which is equivalent to a binary trust game. The first-mover choice in the sequential PDG measures trust, while

https://doi.org/10.1017/S1930297500008998 Published online by Cambridge University Press

the second-mover choice (conditional on the other player having contributed) measures trustworthiness.[4]

In the *DG*, subjects chose how much of 60 SEK (about $6.9) to give to another, randomly selected player. In the DG charity, subjects had two opportunities to give any amount of 60 SEK to a charity (Red Cross, Unicef). The order of the PDGs, the PGG, the DG and DG charitable giving was randomized. No feedback about the outcomes of the games was given before the end of the experiment.

TABLE 1: Measures of prosocial behavior in experiment.

Prisoner's dilemma game (PDG)	Two players made simultaneous, binary choice whether to contribute money or not
Public goods game (PGG)	Four players made simultaneous, binary choice whether to contribute money or not
Trust game	First-mover binary choice in a sequential PDG (trust) Second-mover binary choice in sequential PDG conditional on contribution by other player (trustworthiness)
Dictator game (DG)	Amount between 0–60 given to another player
Dictator game charity (DG charity)	Amount between 0–60 given to a charitable organization (played twice with different organizations)

For the main analysis, we converted each incentivized measure to a z score and constructed a composite measure of prosocial behavior. As shown in Table 2, all six measures of prosocial behavior correlate modestly, indicating that there is a single component that accounts for most of the common variance. The estimated reliability coefficient (Cronbach alpha) of the combined composite measure is respectable .72. All incentivized measures of prosocial behavior correlated positively with self-reported charitable giving during the last 12 months (Rushton et al., 1981).

Individual differences in processing style Individual differences in processing styles were measured with the Unified Scale to Assess Individual Differences in Intuition and Deliberation (USID, Pachur & Spaar 2015), which addresses weaknesses of previously used processing style measures and unifies them, such as the Preference for Intuition and Deliberation scale (PID, Betsch 2004) and the Rational-Experiential Inventory (REI, Pacini & Epstein 1999). Subjects rated 32 statements according to how well they describe

[4]To allow for the matching of all possible cases, we also elicited the second-mover choice conditional on the other player having defected.

https://doi.org/10.1017/S1930297500008998 Published online by Cambridge University Press

TABLE 2: Correlations among the measures of prosocial behavior (n=1828). All correlations are significant (p<0.001).

	M	2	3	4	5	6	7
1. Dictator game (charity)	0.53	0.34	0.20	0.29	0.23	0.17	0.36
2. Dictator game	0.38	·	0.27	0.37	0.26	0.25	0.17
3. Prisoners' dilemma	0.66	·	·	0.30	0.48	0.36	0.13
4. Public goods game	0.58	·	·	·	0.30	0.26	0.16
5. Trust game (trust)	0.64	·	·	·	·	0.42	0.15
6. Trust game (trustworthiness)	0.74	·	·	·	·	·	0.10
7. Charitable giving (self-reported)	2.93	·	·	·	·	·	·

Note: Mean for dictator game (charity) and dictator game represent mean % of endowment given. Mean for charitable giving (self-reported) represent how often subjects stated that they had given money to charity during the last 12 month measured on a 5-point scale ranging from 1 (never) to 5 (very often). For all other measures mean values represent share who acted prosocially in binary choice situations.

their own decision-making style in life in general on 5-point Likert scales. One half of the statements described intuitive and spontaneous decision making, the other half of the statements described decision making that is based on reason and knowledge. Taking the mean of all statement ratings in the USID for each individual, we constructed three measures of processing styles: (i) a score that measures the individual tendency to rely on intuition in decision making, (ii) a score that measures the individual tendency to rely on deliberation in decision making, and (iii) a measure for decision style subtracting the tendency to rely on deliberation (i) from the tendency to rely on intuition (ii): 4(max intuitive) to –4(max deliberation). The latter is the measure of processing style we use in our main analyses.

The order in which subjects responded to the trait elicitation questionnaire (USID) and the incentivized prosocial choices was randomized. Order had no significant effect on processing style.

3 Results

Manipulation checks Table 3 shows the result of our manipulation checks. Subjects reported lower reliance on deliberation and higher reliance on their emotions and intuition in the affect treatment, compared to the reason treatment. The share of rational choices in the jellybean task was lower in the affect treatment than the reason treatment. Thus, our manipulation checks suggest that the instruction treatments successfully manipulated decision processing.

https://doi.org/10.1017/S1930297500008998 Published online by Cambridge University Press

TABLE 3: Manipulation checks.

	Treatments			Difference
	Baseline	Affect	Reason	Affect vs. Reason
Relied on intuition (mean rating)	3.23	3.51	3.02	<0.001
Relied on emotions (mean rating)	3.10	3.53	2.69	<0.001
Relied on deliberation (mean rating)	3.84	3.66	3.95	<0.001
Instructions: thought more (mean rating)	3.46	3.42	3.50	0.215
Jellybean task: rational choices (in percent)	0.67	0.63	0.70	0.010

Note: Averages were estimated using full sample. The last columns present p-values of two-sided t-tests and χ^2-tests, respectively. "Relied on intuition" measures the answer to "I relied on my intuition when making the decisions in this experiment.", "Relied on emotions" measures the answer to "I relied on my emotions when making decisions in this experiment.", "Relied on deliberation" measures the answer to "I relied on my deliberation when making the decisions in this experiment.", and "Instructions: thought more" measures the answer to "The instructions in this experiment made me think more about my decisions." All responses were on 5-point Likert scales, except for the jellybean task, which reports the share of rational (non-dominated) choices in the jellybean task.

Effects of decision mode on prosocial behavior Figure 1 shows the effects of our experimental manipulation of decision mode on prosocial behavior. We find that inducing affect, rather than reason, increased prosocial behavior (0.09 vs. –0.11, $t(1214) = -5.51$, $p < 0.001$, $d = 0.32$). The effect of inducing a affective decision mode was positive and significant for five out of the six prosocial choices included in our composite measure of prosocial behavior. The only choice where we did not detect a significant increase in prosocial behavior was in the public goods game. Thus, the positive effect of inducing affect, rather than reason, on cooperation in the prisoner's dilemma game, as previously found in Levine et al. (2018), extends to our comprehensive cross-game measure of prosocial behavior. The effect was robust in different subsets of the six decisions, including when looking only at "pure" prosocial choices (excluding trust), "strategic" prosocial choices (PDG, PGG, and trust), and "non-strategic" prosocial choices (trustworthiness, DG, and charitable giving).

Compared to the baseline treatment, the affect treatment had a positive effect on the level of prosocial behavior (0.09 vs. 0.02, $t(1222) = -1.94$, $p = .053$, $d = 0.11$), while the reason treatment had a negative effect (-0.11 vs. 0.02, $t(1213) = 3.60$, $p < .001$, $d = 0.21$). Inducing a deliberative decision mode made up the largest part of the difference between the Affect and Reason treatments.

https://doi.org/10.1017/S1930297500008998 Published online by Cambridge University Press

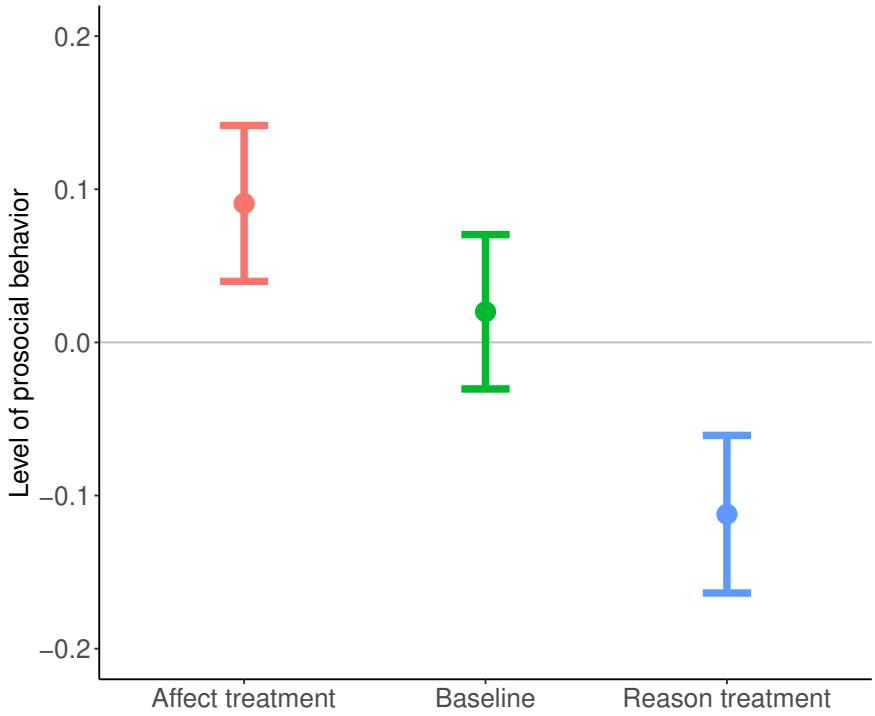

FIGURE 1: Level of prosocial behavior across experimental treatments. The value zero on the Y-axis indicates the average level of prosocial behavior (composite measure) in our total sample based on decisions made in the prisoner's dilemma game, public goods game, trust game (trust and trustworthiness), dictator game and dictator game with charity.

Effects of individual differences in processing style and prosocial behavior Figure 2 shows the relation between processing style and prosocial behavior across all conditions. Prosocial behavior are not significantly correlated with processing style (r = .013, p = .571). This lack of correlation holds when analyzing each condition separately, for different subsets of games, and for five out of the six prosocial choices included in our composite measure. There is a weak positive correlation between intuitive processing style and the amount given in the dictator game (r = .048, p = .041). This significant result in the dictator game does however not remain when taking multiple testing into account (Bonferroni). Overall, these results suggest that individual differences in the tendency to use an intuitive or a deliberative processing style do not affect prosocial behavior.

Interaction between decision mode and individual differences in processing styles Next, we asked whether individual differences in decision style interacted with our experimental manipulation of decision mode, i.e., whether the effect of inducing affect and reason varied across the individually preferred processing style. Table 4 shows the results from regression analyses where we include interactions and adjust for age, gender, and education. We observe the same pattern as illustrated in Figures 1 and 2, with regard to the effect of our experimental treatments and individual differences in processing style on prosocial

https://doi.org/10.1017/S1930297500008998 Published online by Cambridge University Press

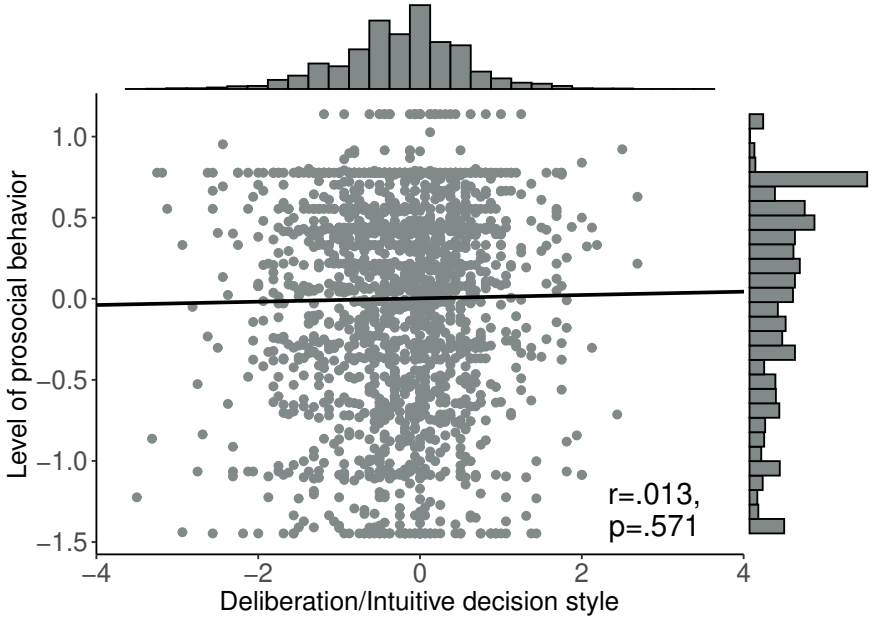

FIGURE 2: Prosocial behavior and individual differences in processing style (n = 1828). The figure shows scatter plot of the level prosocial behavior for processing different styles. –4 indicate maximum reliance on deliberation. 4 indicate maximum reliance on intuition.

behavior. We also observe that subjects who rely more on an intuitive processing style are less likely to make rational choice in the jellybean task compared to subjects who primarily rely on deliberation (Model 3). We detect no significant interactions between decision mode and individual differences in processing style on prosocial behavior.

TABLE 4: Prosocial behavioral as function decision mode and processing style.

	Prosocial behavior				Jellybean			
	(1)		(2)		(3)		(4)	
Age	0.002**	(0.001)	0.002**	(0.001)	0.001	(0.001)	0.001	(0.001)
Female	0.064**	(0.030)	0.063**	(0.030)	−0.094***	(0.022)	−0.093***	(0.022)
Affect treatment	0.070*	(0.036)	0.067*	(0.038)	−0.047*	(0.027)	−0.055*	(0.029)
Reason treatment	−0.131***	(0.037)	−0.126***	(0.038)	0.021	(0.026)	0.015	(0.028)
Processing style	0.017	(0.019)	0.016	(0.032)	−0.058***	(0.014)	−0.037	(0.023)
Affect treatment * Processing style			−0.014	(0.046)			−0.036	(0.032)
Reason treatment * Processing style			0.014	(0.045)			−0.025	(0.031)
R^2	0.037		0.037		0.046		0.047	

Note: All regressions are OLS adjusted for education level. The composite measure of prosocial behavior is used as the dependent variable in model 1 and 2. Rational choice in the jellybean task is used as the dependent variable in model 3 and 4. Processing style takes a value between –4 (maximum reliance on deliberation) and 4 (maximum reliance on intuition). Robust standard errors adjusting for heteroscedasticity in parenthesis.

https://doi.org/10.1017/S1930297500008998 Published online by Cambridge University Press

4 Discussion and conclusion

The conflict between affect and reason has traditionally been a focus of the research on prosocial behavior. Less attention has been devoted to how decision mode and individual differences in processing style jointly influence prosocial behavior. In this paper, we provide results from a carefully designed test of the effect of decision mode and individual differences on a series of choices measuring prosocial behavior in a large-scale survey experiment. The key findings from this study can be summarized as follows.

First, we see a main effect of an affect/reason-intervention using direct instructions on cooperation behavior, in line with Rand (2016) and Levine et al. (2018). We can show that this effect extends to a more comprehensive, cross-game measure of prosocial behavior. Noticeably, we find that the negative effect of inducing reason on prosocial behavior makes up a larger share of the total effect of the affect/reason-distinction than the positive effect of inducing emotion. Thus, future research should focus more on the impacts of (degrees of) deliberation on prosocial behavior. Recent meta-studies find no evidence of an effect of manipulating dual processing on cooperation games other than through direct instructions (Kvarven et al. 2020), or when studying altruistic behavior (Fromell et al. 2020). We find a positive effect of inducing affect rather than reason through direct instructions on prosocial behavior in several games, including the prisoner's dilemma game, the trust game, the dictator game, and charitable giving.

We choose to experimentally manipulate intuitive/deliberative decision mode by directly asking people to either rely on affect or reason, since previous meta-studies have shown this to be the most effective way to alter cooperation in social dilemmas (Kvarven et al. 2020). However, it should be noted that the experimental instructions to follow your "emotions" could have a double meaning. One is indeed to follow your intuition. But the other is to respond with empathy, akin to an experimenter's demand effect. This response could possibly explain why this type of affect manipulations seem to be more effective in altering cooperative behavior in comparison to other manipulations of intuition, which has been found to be largely ineffective.

Second, we see no effect of individual differences in the tendency to use an intuitive or a deliberative processing style on prosocial behavior. It should be noted that our measure of intuitive/deliberative processing style correlate with other measures of rational behavior included in the survey e.g., jellybean task (Table 4). Similarly, our composite measure of incentivized prosocial behavior correlates positively with self-reported measures of real-life engagements of charitable giving and cooperative behavior. Thus, it is unlikely that the lack of correlation found between prosocial behavior and individual differences in the tendency to use an intuitive or a deliberative decision mode is due to poor measurement.

Third, interactions between decision mode and individual differences would occur if intuitive decision makers reacted differently than deliberative decision makers to affect- and reason-inducing modes. For example, an intuitive decision mode could increase prosocial behavior more among individuals who prefer to rely on intuition when making decisions

https://doi.org/10.1017/S1930297500008998 Published online by Cambridge University Press

than individuals who prefer to rely on deliberation. Another possibility is that highly deliberative individuals have more scope to raise the focus on their intuition than already intuitive decision makers. Thus, an intuitive decision mode would have a larger positive effect on prosocial behavior among individuals with a more deliberative processing style than individuals with a more intuitive processing style. However, we see no systematic interaction between decision mode and individual differences in either direction in the current study.

Prosocial behavior, where individuals must sacrifice personal benefits for the sake of the greater good, is central in dealing with some on the world's most pressing issues such as overuse of limited resources, poverty, climate preservation, and health. Understanding the mechanism driving prosocial behavior is thus a central challenge. Here we demonstrate that an induced affective decision mode induced, but not individual differences in affective processing style, may increase prosocial behavior.

References

Alós-Ferrer C, Garagnani M. (2020). The cognitive foundations of cooperation. *Journal of Economic Behavior & Organization*, 175, 71–85. https://doi.org/10.1016/j.jebo.2020.04.019.

Allport, G. W., & Odbert, H. S. (1936). Trait-names: A psycho-lexical study. *Psychological Monographs*, 47(1), i-171. https://doi.org/10.1037/h0093360.

Betsch, C. (2004). Präferenz für Intuition und Deliberation (PID): Inventar zur Erfassung von affekt- und kognitionsbasiertem Entscheiden [Preference for Intuition and Deliberation (PID): An Inventory for Assessing Affect- and Cognition-Based Decision-Making]. *Zeitschrift für Differentielle und Diagnostische Psychologie*, 25(4), 179–197. https://doi.org/10.1024/0170-1789.25.4.179.

Betsch, C., & Kunz, J. J. (2008). Individual strategy preferences and decisional fit. *Journal of Behavioral Decision Making*, 21(5), 532–555. https://doi.org/10.1002/bdm.600.

Bouwmeester, S., Verkoeijen, P. P. J. L., Aczel, B., Barbosa, F., Bègue, L., Brañas-Garza, P., ... Wollbrant, C. E. (2017). Registered Replication Report: Rand, Greene, and Nowak (2012). *Perspectives on Psychological Science*, 12(3), 527–542. https://doi.org/10.1177/1745691617693624.

Denes-Raj, V., & Epstein, S. (1994). Conflict between intuitive and rational processing: When people behave against their better judgment. *Journal of Personality and Social Psychology*, 66(5), 819–829. https://doi.org/10.1037/0022-3514.66.5.819.

Capraro, V. (2019). The dual-process approach to human sociality: A review. https://doi.org/10.31234/osf.io/432yw.

Capraro, V, Barcelo, H. (2021) Telling people to "rely on their reasoning" increases intentions to wear a face covering to slow down COVID-19 transmission. *Appl Cognit Psychol.* https://doi.org/10.1002/acp.3793.

Epstein, S. (1994). Integration of the cognitive and the psychodynamic unconscious. *American Psychologist, 49*(8), 709–724. https://psycnet.apa.org/doi/10.1037/0003-066X.49.8.709.

Epstein, S., Pacini, R., Denes-Raj, V., & Heier, H. (1996). Individual differences in intuitive–experiential and analytical–rational thinking styles. *Journal of Personality and Social Psychology, 71*(2), 390–405. https://psycnet.apa.org/doi/10.1037/0022-3514.71.2.390.

Fromell, H., Nosenzo, D., & Owens, T. (2020). Altruism, fast and slow? Evidence from a meta-analysis and a new experiment. *Experimental Economics, 23*, 979–1001 https://doi.org/10.1007/s10683-020-09645-z.

Gärtner, M., Tinghög, G. & Västfjäll, D. (2019). Decision-making traits and states as determinants of risky choices. *CRC TRR 190 Discussion paper series*, Discussion Paper No. 195.

Gärtner, M., Tinghög, G. & Västfjäll, D. (2020). Inducing cooperation with emotion – who is affected? *CRC TRR 190 Discussion paper series*, Discussion Paper No. 235.

Hammond, K. R., Hamm, R. M., Grassia, J., & Pearson, T. (1987). Direct comparison of the efficacy of intuitive and analytical cognition in expert judgment. *IEEE Transactions on Systems, Man, & Cybernetics, 17*(5), 753–770. https://psycnet.apa.org/doi/10.1109/TSMC.1987.6499282.

Higgins, E. T. (2005). Value from Regulatory Fit. *Current Directions in Psychological Science, 14*(4), 209–213. https://psycnet.apa.org/doi/10.1111/j.0963-7214.2005.00366.x.

Horstmann, N., Hausmann, D., & Ryf, S. (2010). Methods for inducing intuitive and deliberate processing modes. In A. Glöckner & C. Witteman (Eds.), *Foundations for tracing intuition: Challenges and methods* (p. 219–237). Psychology Press.

Isler, O., Gächter, S., Maule, A.J. & Starmer, C. (2021). Contextualised strong reciprocity explains selfless cooperation despite selfish intuitions and weak social heuristics. Scientific Reports 11, 13868. https://doi.org/10.1038/s41598-021-93412-4.

Kirkpatrick, L. A., & Epstein, S. (1992). Cognitive-experiential self-theory and subjective probability: Further evidence for two conceptual systems. *Journal of Personality and Social Psychology*, 63(4), 534–544. https://doi.org/10.1037/0022-3514.63.4.534.

Krajbich I, Bartling B, Hare T, Fehr E. (2015). Rethinking fast and slow based on a critique of reaction-time reverse inference. *Nature Communications,* 6(1):7455. https://doi.org/10.1038/ncomms8455.

Kvarven, A., Strømland, E., Wollbrant, C., Andersson, D., Johannesson, M., Tinghög, G., Västfjäll, D., & Myrseth, K. O. R. (2020). The intuitive cooperation hypothesis revisited: a meta-analytic examination of effect size and between-study heterogeneity. *Journal of the Economic Science Association, 6,* 26–42. https://doi.org/10.1007/s40881-020-00084-3.

Levine, E. E., Barasch, A., Rand, D., Berman, J. Z., & Small, D. A. (2018). Signaling

emotion and reason in cooperation. *Journal of Experimental Psychology: General*, 147(5), 702–719. http://dx.doi.org/10.1037/xge0000399.

Mischkowski D, Glöckner A. (2016) Spontaneous cooperation for prosocials, but not for proselfs: Social value orientation moderates spontaneous cooperation behavior. *Scientific Reports*, 6(1):21555. https://doi.org/10.1038/srep21555.

Pachur, T., & Spaar, M. (2015). Domain-specific preferences for intuition and deliberation in decision making. *Journal of Applied Research in Memory and Cognition, 4*(3), 303–311. https://psycnet.apa.org/doi/10.1016/j.jarmac.2015.07.006.

Pacini, R., & Epstein, S. (1999). The relation of rational and experiential information processing styles to personality, basic beliefs, and the ratio-bias phenomenon. *Journal of Personality and Social Psychology, 76*(6), 972–987. https://psycnet.apa.org/doi/10.1037/0022-3514.76.6.972.

Peters, E., Västfjäll, D., Slovic, P., Mertz, C. K., Mazzocco, K., & Dickert, S. (2006). Numeracy and Decision Making. *Psychological Science*, 17(5), 407–413. https://doi.org/10.1111/j.1467-9280.2006.01720.x.

Rand, D. G., Greene, J. D., & Nowak, M. A. (2012). Spontaneous giving and calculated greed. *Nature*, 489(7416), 427–430. https://doi.org/10.1038/nature11467.

Rand, D. G., Peysakhovich, A., Kraft-Todd, G. T., Newman, G. E., Wurzbacher, O., Nowak, M. A., & Greene, J. D. (2014). Social heuristics shape intuitive cooperation. *Nature Communications*, 5(1). https://doi.org/10.1038/ncomms4677.

Rand, D. G. (2016). Cooperation, Fast and Slow. *Psychological Science*, 27(9), 1192–1206. https://doi.org/10.1177/0956797616654455.

Rushton, J. P., Chrisjohn, R. D., & Fekken, G. C. (1981). The altruistic personality and the Self-Report Altruism Scale. *Personality and Individual Differences, 2*(4), 293–302. https://psycnet.apa.org/doi/10.1016/0191-8869(81)90084-2.

Spielberger, C. D., & Sydeman, S. J. (1994). State-Trait Anxiety Inventory and State-Trait Anger Expression Inventory. In M. E. Maruish (Ed.), *The use of psychological testing for treatment planning and outcome assessment* (pp. 292–321). Lawrence Erlbaum Associates, Inc.

Tinghög, G., Andersson, D., Bonn, C., Böttiger, H., Josephson, C., Lundgren, G., ... Johannesson, M. (2013). Intuition and cooperation reconsidered. *Nature*, 498(7452), E1–E2. https://doi.org/10.1038/nature12194.