

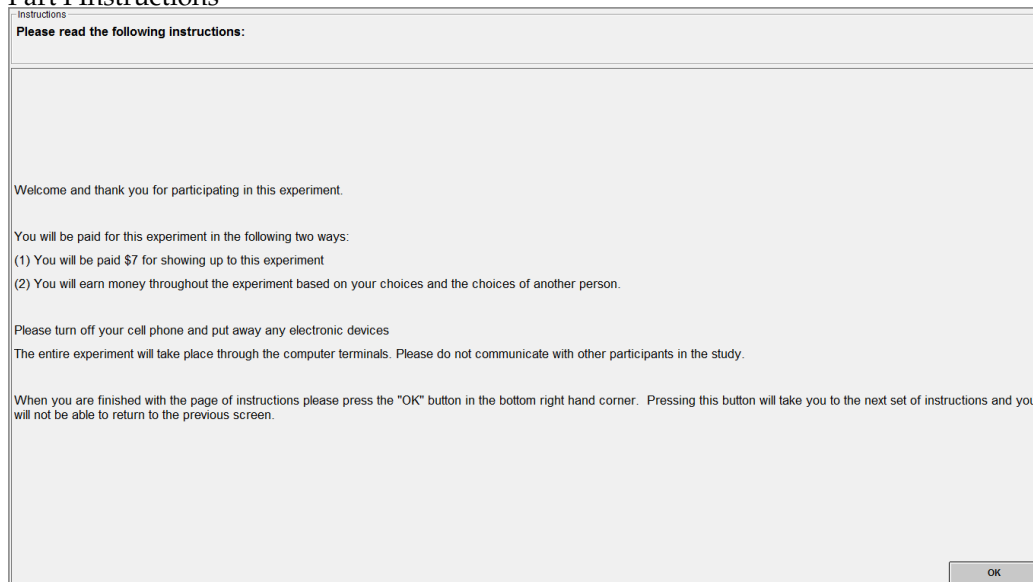
Supplementary Materials: Intentions Versus Outcomes: Cooperation and Fairness in a Sequential Prisoner's Dilemma with Nature

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1. Experiment Instructions

The following screenshots are the instructions viewed by subjects in the experiment for the treatments that received the High Control condition in the first ten rounds. When subjects received the Low Control condition first, subjects viewed the exact same instructions except that the 10% reversal probability in the first part of the instructions was changed to 40%. For the second part, the instructions remained the same except that the 40% reversal probability was changed to 10%.

Part I Instructions



Instructions

Please read the following instructions:

Welcome and thank you for participating in this experiment.

You will be paid for this experiment in the following two ways:

(1) You will be paid \$7 for showing up to this experiment

(2) You will earn money throughout the experiment based on your choices and the choices of another person.

Please turn off your cell phone and put away any electronic devices

The entire experiment will take place through the computer terminals. Please do not communicate with other participants in the study.

When you are finished with the page of instructions please press the "OK" button in the bottom right hand corner. Pressing this button will take you to the next set of instructions and you will not be able to return to the previous screen.

OK

Figure S1. Experimental Instructions

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Instructions

Please read the following instructions:

In this experiment, you will be asked to make a single decision. You will be asked to choose A or B.

Each time you make a decision will be called a period. Part 1 of the experiment will have ten periods and part 2 of the experiment will have ten periods.

Each period you will be randomly matched with one other player. You **will not** be matched with the same player throughout the experiment.

You will be randomly assigned to be the **First Mover** or **Second Mover**. This assignment will stay the same throughout the experiment.

The **First Mover** decides first whether to choose A or B.

The **Second Mover** is told what the **First Mover** chose and then the **Second Mover** decides whether to choose A or B.

Both players will have 30 seconds to make their decision. If a choice is not made before the 30 seconds are up, the default choice will be A.

OK

Figure S2. Experimental Instructions- continued

Instructions

Please read the following instructions:

In part 1 of the experiment, there is a 10% chance that the choice the **First Mover** makes will be reversed by the computer.

For example, if the **First Mover** chooses A, then there is a 90% chance that the choice stays as A and a 10% chance that the choice changes to B.

If the **First Mover** chooses B, then there is a 90% chance the choice stays as B and a 10% chance the choice changes to A.

OK

Figure S3. Experimental Instructions- continued

Instructions

Please read the following instructions:

The **Second Mover** will be told what the **First Mover** chose and what the computer chose for the **First Mover**.

For example, if the **First Mover** selected B and the computer changed the choice to A, then the **Second Mover** will be told that the **First Mover** chose B and the computer changed the choice to A.

If the **First Mover** selected A and the computer did not change the choice, then the **Second Mover** will be told that the **First Mover** chose A and the computer chose A.

The computer will not change the **Second Mover's** choice.

If the **Second Mover** chooses A, then the choice will be A.

If the **Second Mover** chooses B, then the choice will be B.

Only the **First Mover's** choice has a chance to be changed.

OK

Figure S4. Experimental Instructions- Known Treatment Only

Instructions

Please read the following instructions:

The **Second Mover** will only be told what the computer chose for the **First Mover**. The **Second Mover** will not be told what the **First Mover** chose.

For example, if the **First Mover** selected B and the computer changed the choice to A, then the **Second Mover** will be told that the computer chose A for the **First Mover**.

If the **First Mover** selected A and the computer did not change the choice, then the **Second Mover** will be told that the computer chose A.

The computer will not change the **Second Mover's** choice.

If the **Second Mover** chooses A, then the choice will be A.

If the **Second Mover** chooses B, then the choice will be B.

Only the **First Mover's** choice has a chance to be changed.

OK

Figure S5. Experimental Instructions- Uncertain Treatment Only

Instructions

Please read the following instructions:

Computer's Choice for First Mover	Second Mover's Choice	First Mover's Payoff	Second Mover's Payoff
A	A	3	3
B	A	4	1
A	B	1	4
B	B	2	2

The table above shows the possible payoffs in dollars that you and the other player can receive in a period.
 Each row gives a set of possible choices that could occur each period and the payoffs from those choices.
 Notice that the payoffs are determined by what the computer ended up choosing for the **First Mover** and what the **Second Mover** chose.

OK

Figure S6. Experimental Instructions- Payoff Table

Instructions

Please answer the following practice questions:

Question 1: If the **First Mover** chooses A, then there is a 10% chance the computer will change the answer to B. ☐ True ☐ False

Question 2: If the **Second Mover** chooses B, then there is a 10% chance the computer will change the choice to A. ☐ True ☐ False

Question 3: The payoffs for both the **First Mover** and the **Second Mover** are based on what the computer chose for the **First Mover** and what the **Second Mover** chose. ☐ True ☐ False

OK

Figure S7. Experimental Instructions- Comprehension Questions

Instructions

Please read the following instructions:

Question 1: If the **First Mover** chooses A, then there is a 10% chance the computer will change the answer to B.

You answered: True
The correct answer is: True

Explanation: Every time the **First Mover** makes a choice, there is a 10% chance that the computer will change it and a 90% chance the choice will stay the same.

Question 2: If the **Second Mover** chooses B, then there is a 10% chance the computer will change the choice to A.

You answered: False
The correct answer is: False

Explanation: Only the **First Mover's** choice has a chance to be changed. If the **Second Mover** chooses B, then the choice will be B.

Question 3: The payoffs for both the **First Mover** and the **Second Mover** are based on what the computer chose for the **First Mover** and what the **Second Mover** chose.

You answered: True
The correct answer is: True

Explanation: The payoffs are determined by what the computer ends up choosing for the **First Mover**, and what the **Second Mover** chooses. If the **First Mover** chooses B, but the computer changes it to A, and the **Second Mover** chooses A then the payoff will be based on both choosing A.

OK

Figure S8. Experimental Instructions- Comprehension Answers

Instructions

Please read the following instructions:

Additional instructions for part 2 will be given after the completion of part 1.

At the end of the experiment, 3 out of the 20 periods will be randomly selected for payment. The payoffs you receive at the end of the experiment will be based on the results from these 3 randomly selected periods.

Brief Summary

Part 1 of the experiment will consist of 10 periods and part 2 of the experiment will consist of 10 periods.

You will be randomly assigned as the **First Mover** or **Second Mover** and this assignment will be the same throughout the experiment.

In part 1, when the **First Mover** makes a choice there is a 10% chance the computer will reverse that choice. The **Second Mover's** choice will not be changed.

The **First Mover** will choose first. After that choice, the **Second Mover** will be told what the **First Mover** chose and what the computer chose. The **Second Mover** will then make a choice. After this, the results will be shown to both players.

Each period you will have 30 seconds to choose A or B. If you do not make a choice before the 30 seconds are up, then A will be chosen.

This completes the instructions. Please press "OK" to begin the experiment.

OK

Figure S9. Experimental Instructions- Known Treatment Only

Instructions

Please read the following instructions:

Additional instructions for part 2 will be given after the completion of part 1.

At the end of the experiment, 3 out of the 20 periods will be randomly selected for payment. The payoffs you receive at the end of the experiment will be based on the results from these 3 randomly selected periods.

Brief Summary

Part 1 of the experiment will consist of 10 periods and part 2 of the experiment will consist of 10 periods.

You will be randomly assigned as the **First Mover** or **Second Mover** and this assignment will be the same throughout the experiment.

In part 1, when the **First Mover** makes a choice there is a 10% chance the computer will reverse that choice. The **Second Mover's** choice will not be changed.

The **First Mover** will choose first. After that choice, the **Second Mover** will only be told what the computer chose. The **Second Mover** will then make a choice. After this, the results will be shown to both players.

Each period you will have 30 seconds to choose A or B. If you do not make a choice before the 30 seconds are up, then A will be chosen.

This completes the instructions. Please press "OK" to begin the experiment.

OK

Figure S10. Experimental Instructions- Uncertain Treatment Only

Instructions

Please read the following instructions:

In part 2 of the experiment, there is now a 40% chance that the choice the First Mover makes will be reversed by the computer.

For example, if the **First Mover** chooses A, then there is a 60% chance that the choice stays as A and a 40% chance that the choice changes to B.

If the **First Mover** chooses B, then there is a 60% chance the choice stays as B and a 40% chance the choice changes to A.

The **Second Mover** will still be told what the **First Mover** chose and what the computer chose.

OK

Figure S11. Experimental Instructions Part II- Known Treatment Only

Instructions

Please read the following instructions:

In part 2 of the experiment, there is now a 40% chance that the choice the First Mover makes will be reversed by the computer.

For example, if the **First Mover** chooses A, then there is a 60% chance that the choice stays as A and a 40% chance that the choice changes to B.

If the **First Mover** chooses B, then there is a 60% chance the choice stays as B and a 40% chance the choice changes to A.

The **Second Mover** will still only be told what the computer chose.

OK

Figure S12. Experimental Instructions Part II- Uncertain Treatment Only

2. Additional Data Analysis and Robustness Checks

Table S1 presents the the raw empathy and perspective taking scores by treatment and condition. A total of six subjects failed to complete the empathic concern questions and a total of four subjects failed to complete the perspective taking questions. A total of eight subjects failed to complete both the empathic concern and perspective taking questions. In the Known treatment, there was no statistical difference in empathic concern scores in subjects that received the high control first compared to low control (Wilcoxon rank-sum test, $N=121$, $z=-1.10$, $p=0.27$). Results are similar in the Uncertain treatment (Wilcoxon rank-sum test, $N=118$, $z=1.59$, $p=0.11$). When subjects received the High Control condition first, there was no significant difference in empathic concern in the Known treatment compared to the Uncertain treatment (Wilcoxon rank-sum test, $N=122$, $z=-1.58$, $p=0.11$). Similary results occur when subjects received the Low Control condition first (Wilcoxon rank sum test, $N=117$, $z=1.14$, $p=0.25$).

Table S1. Empathy and Perspective Taking Summary Statistics

	High Control First		Low Control First		
	Known	Uncertain	Known	Uncertain	Total
Average:					
Empathic Concern	24.7	25.7	25.1	24.6	25.1
Number of Subjects	60	62	61	56	239
Perspective Taking	26.3	26.0	25.5	25.6	25.9
Number of Subjects	61	63	61	57	242

In the Known treatment, perspective taking ability did not significantly differ between subjects who received the High Control condition first compared to those who received the Low Control condition first (Wilcoxon rank-sum test, $N=122$, $z=1.26$, $p=0.21$). Similarly results hold for the Uncertain treatment (Wilcoxon rank-sum test, $N=120$, $z=0.71$, $p=0.48$). When subjects received the High Control condition first, there was no significant difference between the Known and Uncertain treatments in perspective taking (Wilcoxon rank-sum test, $N=124$, $z=0.419$, $p=0.68$). Similar results are found when subjects received the Low Control condition first (Wilcoxon rank-sum test, $N=118$, $z=-0.06$, $p=0.95$).

Table S2 presents robustness checks for the results from table 3 in the main paper. The analysis is repeated except for the addition of one period lagged variables for the the possible paths of play. The lagged variables are only significant at the 10% in the Known treatment and High Control condition. The hypothesis tests for inequity aversion and reciprocity are similar to the table in the main paper. Table S3 reports fixed effects logit regressions as a further robustness check for table 3 from the main paper. The table gives odds ratios on the probability that the second mover will cooperate given the path of play. The hypothesis tests are similar to table 3 as well.

One worry is that there is multicollinearity between the empathic concern and perspective taking variables. Table S4 repeats the analysis from table 4 in the main paper restricting the regressions to only include empathic concern or perspective taking. Comparing to table 4 all the regressions have similar results except in a few cases. In column (2) of table S4 the coefficient for empathic concern is no longer significant at the 10% level. However, table S5 column(1) shows that empathic concern is still significant when the regression is restricted to cases when the first mover cooperated. In column (4) of table S4, unlike the regression results in the main paper perspective taking is significant at the 5% level. The results for perspective taking are similar in table S5 to table 5 in the main paper. Table S6 and S7 examine empathic concern and perspective taking looking at all 20 rounds finding similar results.

Table S2. Second Mover Cooperation by Treatment with lagged variables

	Known		Uncertain	
	High Control	Low Control	High Control	Low Control
First Mover and Computer cooperated	1.82*** (0.28)	2.18*** (0.34)	1.45*** (0.23)	1.62*** (0.31)
First Mover cooperated and Computer defected		−0.14 (0.49)	0.04 (0.65)	0.42 (0.37)
First Mover defected and Computer Cooperated	1.11** (0.34)	1.75*** (0.34)	1.76*** (0.34)	1.69*** (0.31)
First Mover and Computer cooperated lag	0.49+ (0.28)	−0.19 (0.26)	−0.06 (0.24)	0.11 (0.28)
First Mover cooperated and Computer defected lag	−0.29 (0.52)	0.40 (0.34)	−0.10 (0.53)	0.48 (0.32)
First Mover defected and Computer cooperated lag	0.57+ (0.33)	0.19 (0.29)	0.12 (0.34)	0.01 (0.27)
Low Control First	0.15 (0.64)	0.66 (0.72)	−0.67 (0.60)	1.67* (0.79)
Female	−0.22 (0.38)	0.12 (0.43)	−0.63+ (0.37)	−0.26 (0.55)
Intercept	−1.86** (0.60)	−3.28*** (0.67)	−0.70 (0.52)	−2.82*** (0.75)
<i>N</i>	556	604	562	563
ρ	0.56	0.64	0.51	0.72
Model χ^2	57.85	57.64	59.98	58.48
<u>Hypothesis Tests</u>				
Inequity Aversion (Prob > $\chi^2(1)$)	0.04*	0.08+	0.35	0.79
Reciprocity (Prob > $\chi^2(1)$)	0.00***	0.00***	0.03*	0.00***

Cluster robust standard errors by subject in parentheses. Hypothesis for Inequity Aversion is that cooperation given computer cooperated is the same regardless of first mover's choice. Hypothesis for Reciprocity is that cooperation given first mover cooperated is the same regardless of computer's choice.

Results are from random-effects probit regressions with round fixed effects.

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table S3. Second Mover Cooperation by Treatment- Logit Regressions

	Known		Uncertain	
	High Control	Low Control	High Control	Low Control
First Mover and Computer cooperated	3.06*** (0.49)	3.25*** (0.53)	2.84*** (0.47)	2.64*** (0.53)
First Mover cooperated and Computer defected	−0.70 (1.29)	−0.68 (0.88)	0.13 (1.15)	0.67 (0.61)
First Mover defected and Computer cooperated	1.27* (0.56)	2.47*** (0.53)	3.03*** (0.62)	2.74*** (0.50)
<i>N</i>	620	620	610	610
Model χ^2	97.70	107.69	101.39	95.06
<u>Hypothesis Tests</u>				
Inequity Aversion (Prob > $\chi^2(1)$)	0.01**	0.08+	0.76	0.82
Reciprocity (Prob > $\chi^2(1)$)	0.01**	0.00***	0.02*	0.00***

Cluster robust standard errors by subject in parentheses. Hypothesis for Inequity Aversion is that cooperation given computer cooperated is the same regardless of first mover's choice. Hypothesis for Reciprocity is that cooperation given first mover cooperated is the same regardless of computer's choice.

Results are from fixed effects logit regressions with round fixed effects.

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table S4. Second Mover Cooperation with Empathy and Perspective Taking Robustness(First 10 Rounds)

	<u>All Treatments</u> (1)	<u>Known</u> (2)	<u>All Treatments</u> (3)	<u>All Treatments</u> (4)	<u>Known</u> (5)	<u>Known</u> (6)
	Cooperation	Cooperation	Cooperation	Cooperation	Cooperation	Cooperation
Empathic Concern	0.32** (0.12)	0.31 (0.21)				
Perspective Taking			0.18 (0.12)	0.31* (0.13)	−0.03 (0.21)	0.32 (0.25)
Low Control	0.55** (0.21)	0.53 (0.34)	0.51* (0.22)	0.52* (0.22)	0.48 (0.34)	0.41 (0.34)
Low Control X Perspective Taking				−0.32 (0.26)		−0.89** (0.34)
Uncertain	0.51* (0.21)		0.45* (0.21)	0.45* (0.21)		
First Mover and Computer cooperated	1.33*** (0.18)	1.43*** (0.28)	1.29*** (0.17)	1.29*** (0.17)	1.36*** (0.27)	1.35*** (0.27)
First Mover cooperated and Computer defected	0.04 (0.24)	−0.36 (0.49)	0.10 (0.24)	0.10 (0.24)	−0.43 (0.48)	−0.44 (0.50)
First Mover defected and Computer Cooperated	1.23*** (0.19)	1.15*** (0.28)	1.19*** (0.18)	1.19*** (0.18)	1.09*** (0.26)	1.11*** (0.26)
Female	−0.36 ⁺ (0.21)	−0.15 (0.33)	−0.19 (0.21)	−0.17 (0.21)	0.05 (0.34)	0.17 (0.32)
Intercept	−1.52*** (0.28)	−1.62*** (0.45)	−1.54*** (0.29)	−1.58*** (0.29)	−1.65*** (0.47)	−1.73*** (0.46)
<i>N</i>	1210	610	1220	1220	620	620
ρ	0.43***	0.51***	0.44***	0.44***	0.51***	0.48***
Model χ^2	138.02	63.92	135.91	136.92	64.22	65.79

Results are from random effects probit regressions with round fixed effects. Regressions are from first 10 rounds. Cluster robust standard at the subject level in parentheses

⁺ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table S5. Second Mover Conditional Cooperation with Empathy and Perspective Taking Robustness

	(1) First Mover Cooperated Cooperation	(2) First Mover Defected Cooperation	(3) First Mover Cooperated Cooperation	(4) First Mover Defected Cooperation
Empathic Concern	0.51 ⁺ (0.29)	0.15 (0.20)		
Perspective Taking			0.36 (0.40)	0.23 (0.19)
Low Control	0.61 (0.54)	0.47 (0.31)	0.56 (0.54)	0.30 (0.32)
Low Control X Perspective Taking			−1.01 ⁺ (0.52)	−0.72* (0.33)
Computer cooperated	2.15* (0.88)	1.08*** (0.26)	2.16* (0.89)	1.10*** (0.24)
Female	−0.25 (0.52)	−0.12 (0.36)	0.17 (0.49)	0.10 (0.33)
Intercept	−2.76* (1.11)	−0.90 ⁺ (0.49)	−3.05** (1.17)	−1.06* (0.48)
<i>N</i>	209	306	210	313
ρ	0.67***	0.37***	0.65***	0.37***
Model χ^2	20.87	27.59	20.44	28.93

Results are from random effects probit regressions with round fixed effects. Cluster robust standard errors at the subject level in parentheses

⁺ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table S6. Second Mover Conditional Cooperation in Known Treatment with Empathy- Robustness

	High Control		Low Control	
	First Mover Cooperated	First Mover Defected	First Mover Cooperated	First Mover Defected
Empathic Concern	0.81* (0.39)	0.18 (0.24)	0.86* (0.36)	−0.06 (0.33)
Computer Cooperated	1.76 (1.15)	1.50** (0.52)	2.58*** (0.70)	2.10*** (0.59)
Low Control First	0.25 (0.89)	−0.75 (0.70)	1.02 (1.09)	2.33* (1.17)
Female	−0.49 (0.65)	−0.32 (0.47)	−0.21 (0.54)	0.17 (0.60)
Intercept	−2.36 ⁺ (1.38)	−0.67 (0.63)	−3.66* (1.44)	−3.76*** (1.03)
<i>N</i>	135	231	236	266
ρ	0.72	0.52	0.69	0.71
Model χ^2	11.68	19.40	25.65	21.80

Regressions are from random effects probit regressions with round fixed effects. Cluster robust standard errors at the subject level in parentheses. Regressions include all 20 rounds.

⁺ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table S7. Second Mover Conditional Cooperation in Known Treatment with Perspective Taking-Robustness

	High Control		Low Control	
	First Mover Cooperated	First Mover Defected	First Mover Cooperated	First Mover Defected
Perspective Taking	0.39 (0.48)	0.23 (0.22)	0.56 (0.43)	0.34 (0.40)
Low Control First	0.29 (0.91)	−0.53 (0.60)	0.66 (0.90)	2.09 ⁺ (1.07)
Low Control First X Perspective Taking	−0.87 (0.84)	−0.60 ⁺ (0.35)	−1.36* (0.55)	−1.17 ⁺ (0.61)
Computer Cooperated	1.79 (1.28)	1.20*** (0.35)	2.50*** (0.69)	1.96*** (0.50)
Female	0.02 (0.64)	−0.03 (0.36)	0.44 (0.48)	0.38 (0.53)
Intercept	−2.86 ⁺ (1.61)	−0.93 ⁺ (0.56)	−3.63** (1.27)	−3.69*** (0.94)
<i>N</i>	136	282	239	288
ρ	0.76	0.43	0.65	0.68
Model χ^2	9.76	23.59	25.37	22.57

Regressions are from random effects probit regressions with round fixed effects. Cluster robust standard errors at the subject level in parentheses. Regressions include all 20 rounds.

⁺ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$