Online Appendix for "Coordination with Differential Time Preferences: Experimental Evidence"

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Abstract

This appendix provides: i) details on the statistical comparison of coordination across our treatments; ii) analysis illustrating that behavior across all super-games resembles behavior in the last 5 super-games; iii) analysis showing that behavior in later blocks is consistent with behavior in the first block; iv) a depiction of the rapid adoption of turn-taking and intertemporal-trade strategy profiles even at the start of sessions; v) an illustration of the limited variation in individual tendencies to demand immediate high payoffs and the limited explanatory power of our risk and altruism elicitations; vi) an analysis of participants' free-form descriptions of their utilized strategies; and vii) detailed sample instructions used in our experimental sessions.

A Statistical Comparison of Treatments

Our main analysis is conducted using Probit regressions with standard errors clustered at the session level to account for interdependencies that come from rematching participants across matches within a session. We supplement this analysis by computing session averages—one observation per session—and identifying treatment effects using these averages via a two-sided t-test. This complementary analysis delivers similar qualitative results, but naturally produces much larger standard errors.

Table A.1 displays p-values corresponding to pairwise comparisons of coordination failure rates across our treatments. We compare both the coordination failure rates in round 1 of the first block, and the likelihood of any coordination failure in the first block. We include comparisons pertaining to all super-games, as well as the last 5 super-games.

Our regression analysis confirms that, as reported in the main text, in the last 5 super-games, the comparisons between the Equal Low and Equal High treatments, the Equal Low and Unequal Mixed treatments, and the Unequal Low and Unequal Mixed treatments

Table A.1: Miscoordination Rates in the First Block: Treatment Effects

	all super-games		last 5 super-games	
	round 1	at least once	round 1	at least one
Equal Low vs Equal High	$p = 0.002$	$p = 0.098$	$p = 0.021$	$p = 0.043$
Equal Low vs Unequal Low	$p = 0.802$	$p = 0.569$	$p = 0.043$	$p = 0.732$
Equal Low vs Uneq Mixed	$p = 0.014$	$p = 0.009$	$p = 0.002$	$p = 0.004$
Equal High vs Unequal Low	$p = 0.001$	$p = 0.017$	$p = 0.125$	$p = 0.026$
Equal High vs Uneq Mixed	$p = 0.375$	$p = 0.553$	$p = 0.898$	$p = 0.429$
Uneq Mixed vs Unequal Low	$p = 0.012$	$p = 0.000$	$p = 0.043$	$p = 0.002$

Notes: Results correspond to Probit regressions for round 1 miscoordination rates and for at least one coordination failure throughout the first block. Standard errors are clustered at the session level.

are all highly significant. All these comparisons are significant even when considering all super-games, a point which we now turn to inspect in more detail.

Session averages of miscoordination rates echo the results reported in the paper, as illustrated in Table A.2. The relevant statistical comparisons are reported in Table A.3, which is the analogue of Table A.1. Those comparisons are similar to those reported using regression analysis and are never significantly different.

Table A.2: Miscoordination Rates in the First Block: Session Averages

	all super-games		last 5 super-games	
	round 1	at least once	round 1	at least one
Equal Low	0.126	0.222	0.140	0.212
Equal High	0.034	0.123	0.017	0.082
Unequal Low	0.117	0.262	0.070	0.238
Unequal Mixed	0.047	0.090	0.018	0.049

Notes: Session averages are reported. There are 4 observations in the Equal Low and Equal High treatments and 5 observations in the Unequal Low and Unequal Mixed treatments.

B Behavior Across All Super-Games

Behavior across all super-games resembles the behavior seen in the last 5 super-games after participants had gained experience, as shown in Figure B.1. The figure replicates Figure 3 in the main text.

While the general patterns are similar, we see more alternation in the Equal Low treatment across all super-games and more noise in responses in the Unequal Mixed treatment.

Table A.3: Miscoordination Rates in the First Block:
Treatment Effects using Session Averages

	all super-games		last 5 super-games	
	round 1	at least once	round 1	at least one
Equal Low vs Equal High	$p = 0.061$	$p = 0.224$	$p = 0.026$	$p = 0.114^*$
Equal Low vs Unequal Low	$p = 0.856$	$p = 0.610$	$p = 0.129^*$	$p = 0.784$
Equal Low vs Uneq Mixed	$p = 0.071$	$p = 0.059$	$p = 0.013$	$p = 0.029$
Equal High vs Unequal Low	$p = 0.051$	$p = 0.075$	$p = 0.084$	$p = 0.105^*$
Equal High vs Uneq Mixed	$p = 0.512$	$p = 0.509$	$p = 0.938$	$p = 0.487$
Uneq Mixed vs Unequal Low	$p = 0.066$	$p = 0.013$	$p = 0.058$	$p = 0.031$

Notes: Two-sided t-test results are reported using one observation per session. Whenever the results of the one-sided t-test are qualitatively different from the two-sided t-test, we indicate this with an asterisk *: in all instances of this kind, the one-sided t-test delivers significant difference between treatments at the 6% level.

Figure B.1: Conditional Payoffs Across All Super-Games

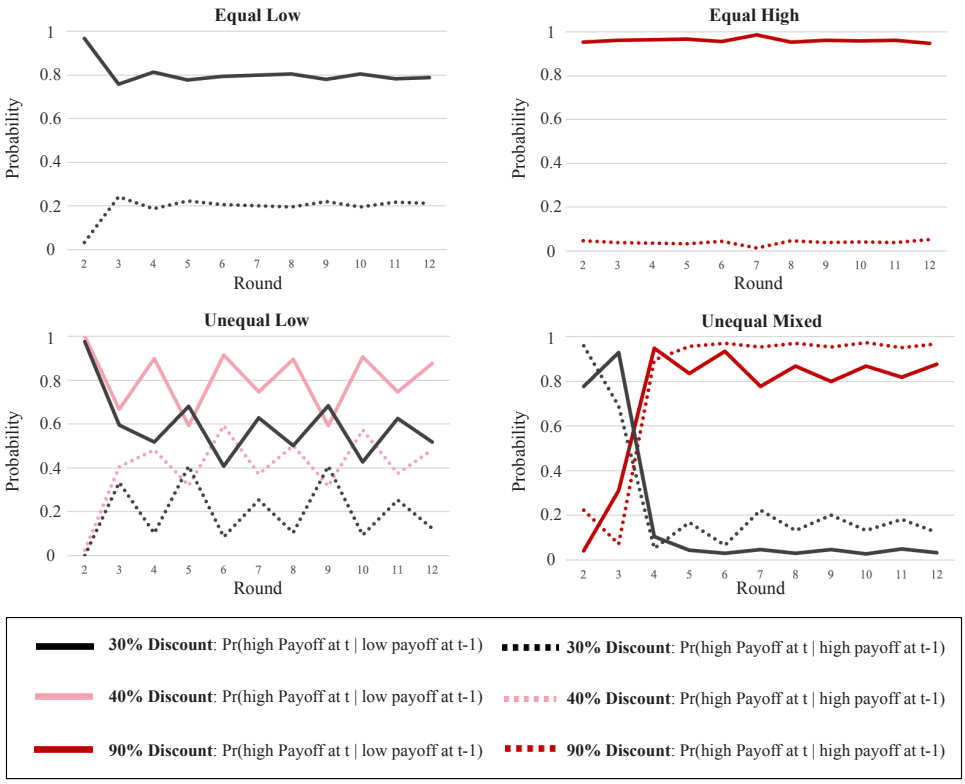
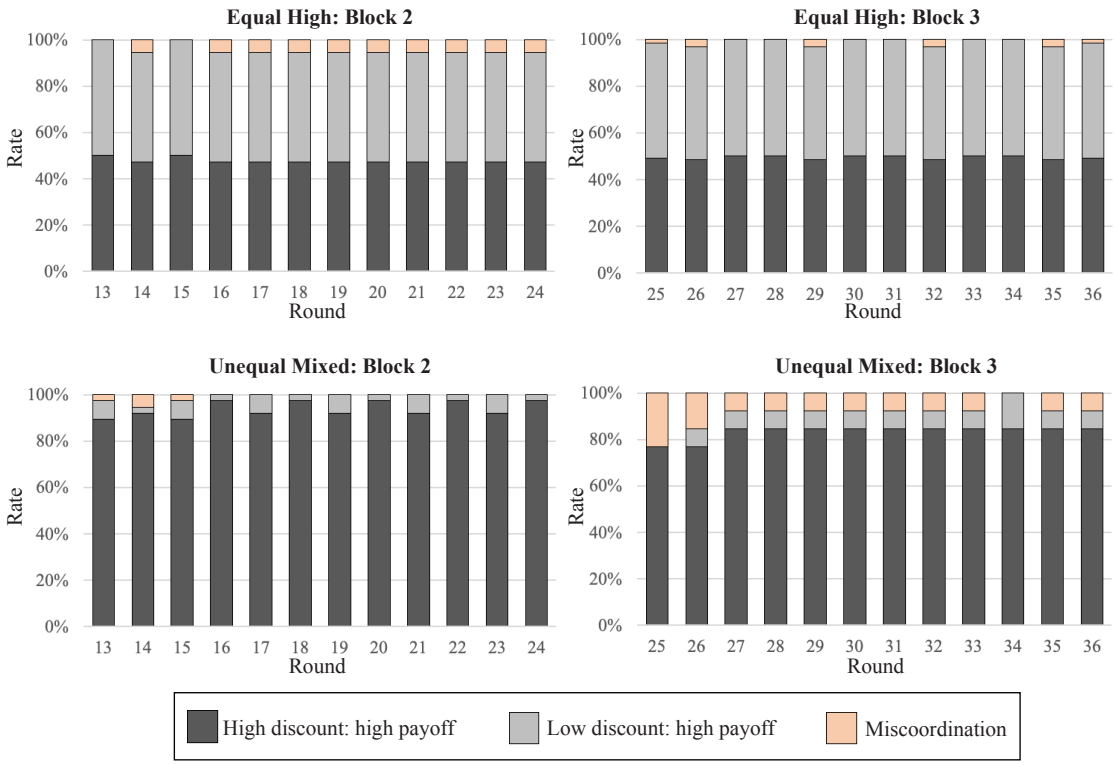


FIGURE C.2: Coordination Patterns across Treatments in Blocks 2 and 3



C Behavior in Later Blocks

Figure C.2 displays an analogue of Figure 1 in the main text for blocks 2 and 3 in the Equal High and Unequal Mixed treatments, where we have sufficient data. By block 3, coordination rates fall somewhat, but the patterns of play remain similar. In particular, in the Unequal Mixed treatment, conditional on successful coordination, the more patient player continues to receive the high coordination payoff even at later rounds of play.

The classification of strategies used in the second and third blocks of the last 5 supergames also echoes the classification in the first block (see Table 2 in the main text). Specifically, in our Equal High treatment, in the second block (64 pairs), 94% of pairs play the turn-taking strategy profile, and no pair plays the intertemporal-trade strategy profile, providing the high coordination payoff to one player alone. The same holds for the third block (18 pairs), where 94% of the pairs play the turn-taking strategy profile.

Similarly, in the Unequal Mixed treatment, in the second block (38 pairs), 87% of the pairs have the patient player receive the high coordination payoff in all 12 rounds, while 8% of pairs play the turn-taking strategy profile. By the third block (13 pairs), we see

some decline in the fraction of pairs in which the patient agent consistently receives the high coordination payoff, albeit data are limited: only 69% of pairs have the patient agent being rewarded as such across all 12 rounds. As in the second block, 8% play the turn-taking strategy profile.

D Learning to Coordinate

Participants coordinate on turn-taking and intertemporal-trade strategy profiles even at the start of our sessions, as illustrated in Table D.4. The table is an analogue of Table 2 in the main text, where we focus on the first 5 super-games in each session. Turn-taking strategy profiles are prevalent when players' discount factors are similar right from the start of sessions. Similarly, intertemporal-trade strategies are common in the Unequal Mixed treatment even at sessions' beginning, although they occur at even higher rates later on.

Table D.4: Distribution of Strategy Profiles in the First 5 Super-Games

Treatment	Turn-Taking		Intertemporal-Trade					Other Strategies		
	frac	chat if play	frac	chat if play	length | play 1	2	3	frac	round 1 miscoor	high-low
Equal Low	0.65	0.93	0.09	0.89	1.00			0.27	0.43	
Equal High	0.83	0.99	0.00					0.17	0.32	
Unequal Low	0.47	0.98	0.18	0.88	1.00			0.35	0.47	0.49
Unequal Mixed	0.09	1.00	0.75	0.99		0.32	0.63	0.15	0.52	0.35

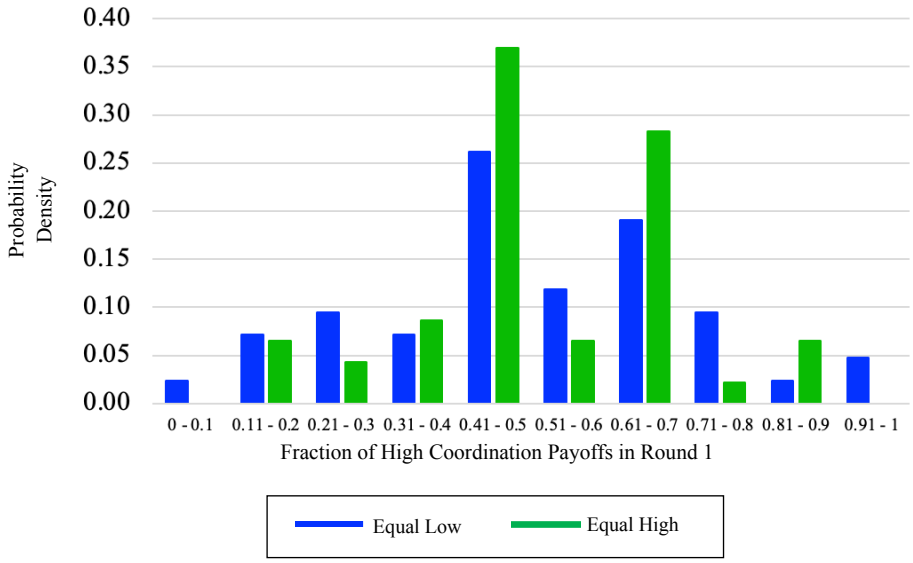
Notes: "Chat if play" corresponds to how often pair members discussed playing the relevant strategy conditional on playing it. In the last two columns, we report two characteristics of other types of strategies played: the rate of miscoordination and the frequency of allocating a high payoff to a low discount factor player in the first round.

The table suggests that the turn-taking and intertemporal-trade profiles have drawing power that is not purely driven through experience with the strategic environment.

E Individual Tendencies and the Limited Explanatory Power of Elicited Risk and Altruism

We see limited variation in individual tendencies to demand high initial payoffs, as illustrated in Figure E.3. To generate the figure, we calculate the fraction of super-games in which each participant received the low coordination payoff in the first round of the super-game, conditional on coordination in that round. The figure displays the resulting distributions for our Equal Low and Equal High treatments, where discount factors do not distinguish between the two players.

FIGURE E.3: Individual-Level Distributions of Round 1 Frequency of Low Coordination Payoff Across Super-Games



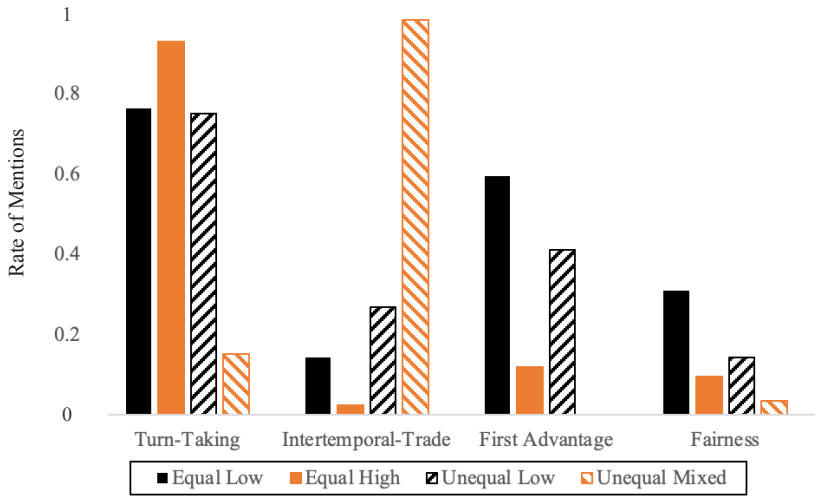
The distributions across the treatments resemble one another and do not appear skewed towards any fraction. In other words, there are no clear "types" in our data.

As described in the main text, we elicited risk and altruistic attitudes at the end of each session. Risk and altruism do not appear to explain concessions of players in the first round of super-games, as shown in Table E.5. To assess the impacts of risk and altruism, we first calculate the fraction of super-games in which each participant conceded in round 1 and agreed to a lower payoff, conditional on coordination in the first round of the super-game. In treatments with unequal discount factors across the players, we focus only on the more patient players. We explain these fractions with risk and altruism, relying on their duplicate elicitations, using ORIV (Gillen et al., 2019), and controlling for the number of super-games in which the relevant players coordinated in round 1. Errors are clustered at the individual level. Table E.5 contains the resulting p-values for both risk and altruism. As can be seen, across treatments, neither has a significant effect on concession rates.

TABLE E.5: Significance of Risk and Altruism in Explaining Round 1 Concessions

	Equal Low	Equal High	Unequal Low	Unequal Mixed
risk	0.541	0.748	0.621	0.344
altruism	0.435	0.985	0.938	0.912

FIGURE F.4: Items Mentioned in Participants' Free-form Exit Surveys



F Free-Form Exit Surveys

At the end of each session, we asked participants to write down what guided their behavior. These data were not incentivized, and should therefore be interpreted with care. However, they provide some insights into how participants approached our experiments. The most prevalent themes discussed in these texts pertained to the turn-taking strategy, the intertemporal-trade strategy, the advantage to the first player who receives the high coordination payoff, and fairness or equity considerations. Figure F.4 displays the rates at which each of these four topics was discussed in participants' free-form texts across our treatments. As can be seen, in the Equal Low, Equal High, and Unequal Low treatments, participants mention the turn-taking strategy at very high rates, all exceeding 70%.[1] The intertemporal-trade strategy is described by over 90% of participants in the Unequal Mixed treatment. The advantage granted to the first player for receiving the high coordination payoff is noted at substantial rates when at least one of the players has a low continuation probability of 30%. These observations are in line with our interpretation of participant choices as reflecting comprehension and intentionality.

Fairness and equity considerations do not appear frequently in participants' texts,

[1] Here are a few quotes: "Acted to maximize expected payoffs alternative selections each round (RG, BP, etc..). Tried to make It so that I would have the 6 payoff in round 1 of each game (so 1 payoff in round 2). This worked in 8/10 games. In other two games disagreement thus zero payoff for both players", "I was trying to get my partner to choose the pair that would give me 6 and give them 1 in the first round. If someone did not want to communicate, I would just choose 6,1 option every time", "I played the game with my partner to the best of my ability but communication is key. First, I started playing the game by alternating, however, realized that this is unfair for the person on the 2nd round. So, instead, one person gets major payout on the first round then the other one will for the remaining rounds."

other than in the Equal Low treatment, when the tension revolving around who receives the high coordination payoff first is arguably the strongest. In other treatments, fairness and equity considerations are discussed rarely: for example, in our Unequal Mixed treatment, they are noted in fewer than 5% of texts.

G Sample Instructions

We present instructions used in the Unequal Mixed and Equal High treatments. The text in black corresponds to the Unequal Mixed treatment, while the text in olive in parentheses corresponds to the Equal High treatment. The presented screenshots are from the Unequal Mixed treatment. The screenshots for the Equal High treatment were identical except for the continuation probability of Player A specified in the top right corner of the screen, which was 30% in the Unequal Mixed treatment and 90% in the Equal High treatment.

G.1 Main Instructions

Welcome

- Welcome to PExL and thank you for participating in today's experiment.
- Please place all of your personal belongings away so that we can have your complete attention.
- Please use the laptops as instructed. In particular, please do not attempt to browse the web or use programs unrelated to the experiment.

Guidelines

- You will be paid in private and in cash at the end of the experiment.
- The amount that you ultimately earn in the experiment depends on your decisions, the decisions of others, and random chance. You have each earned a $10 payment for showing up on time.
- You will be using laptops for the entire experiment, and all interactions between yourself and others will take place via the laptop's terminal.
- Please DO NOT socialize or talk.

Overview

- Today's experiment is about strategic interactions.

- The main part of the experiment consists of **10 games**.
- We will also ask you to complete several simple tasks at the end.
- At the beginning of each game, you will be randomly assigned a **label**: either **Player A** or **Player B**.
- **Your label will remain fixed within a game, but will vary across games.**
- Once the labels are determined, you will be randomly paired with a person who has a different label.
- Within a game, you will interact with the same person.
- During each game, you will be asked to make decisions over a sequence of rounds.

Round Payoffs

	Player B's choice	
Player A's choice	**R**	**B**
G	1, 6	0, 0
P	0, 0	6, 1

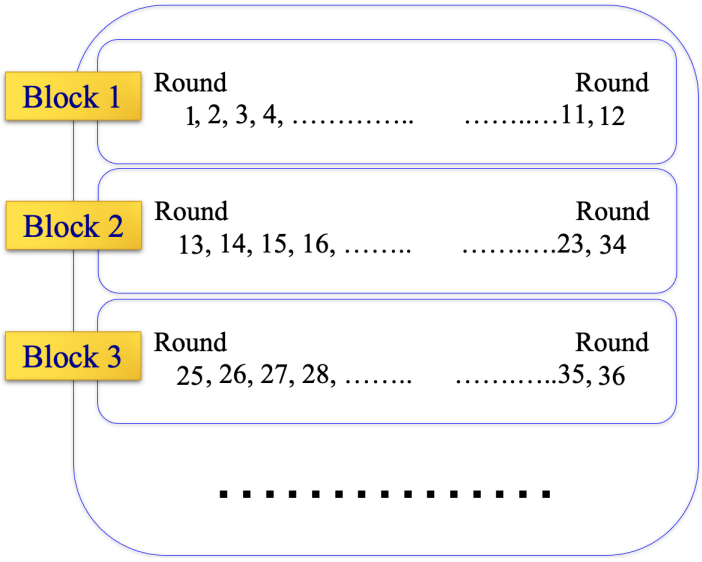
- In each round, you will be asked to choose one of two actions. For Player A, actions are G and P. For Player B, actions are R and B.
- The payoffs (in points) are determined by your action and the action chosen by the person paired with you. The payoff table for Player A is described above.
- The first entry in each cell represents Player A's payoff, while the second entry represents the payoff of Player B. That is, if:
  - Player A selects G and Player B selects R, Player A gets 1 while Player B gets 6.
  - Player A selects G and Player B selects B, you each get 0.
  - Player A selects P and Player B selects R, you each get 0.
  - Player A selects P and Player B selects B, Player A gets 6 while Type B gets 1.

- If you are Player B, the rows and the columns in the payoff table will be switched so that you will be asked to choose between row actions.
- Once you and the person you are paired with choose your actions, those choices will be highlighted and your payoff for the round will appear.

Game Length

- The length of a game, i.e., the number of rounds in a game, is randomly determined.
- After each round, the game will continue to the next round only with some probability.
- If you are Player A, the probability the game will continue is 30% (90%). If you are Player B, the probability the game will continue is 90%.
- You will play every game in blocks of 12 rounds.
- At the end of each block, if the game has not ended for at least one player in your pair, you will play another block of 12 rounds.
- If the game has ended for both players in a block, you will see in which round it has ended and move to the next game.

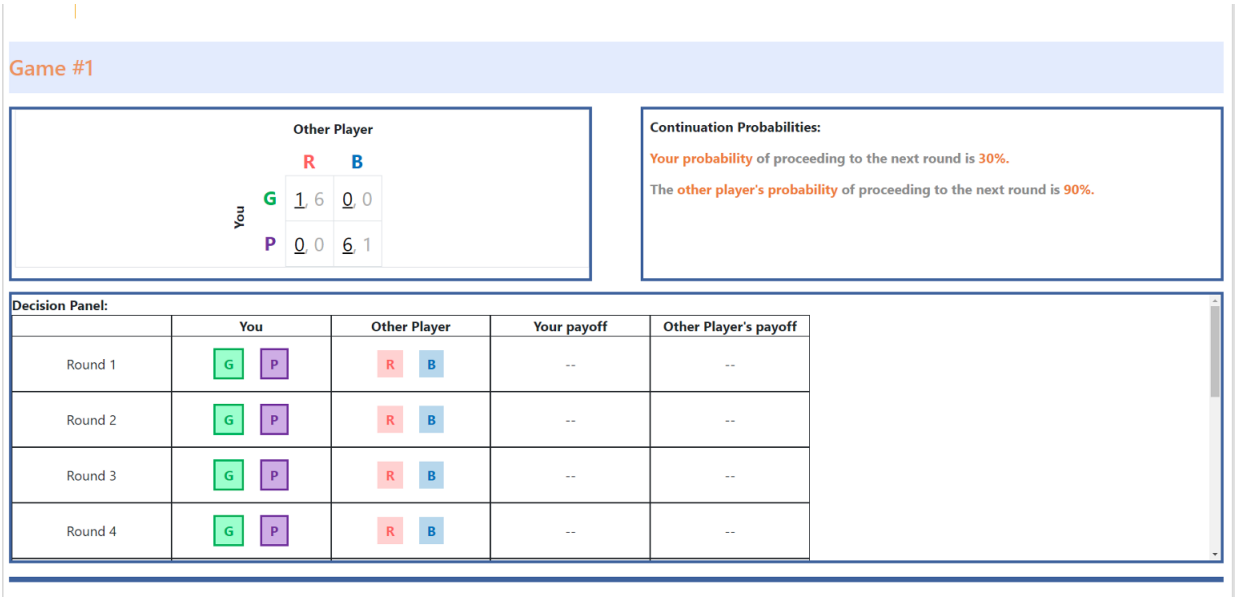
Game Structure



Probabilities of Game Length

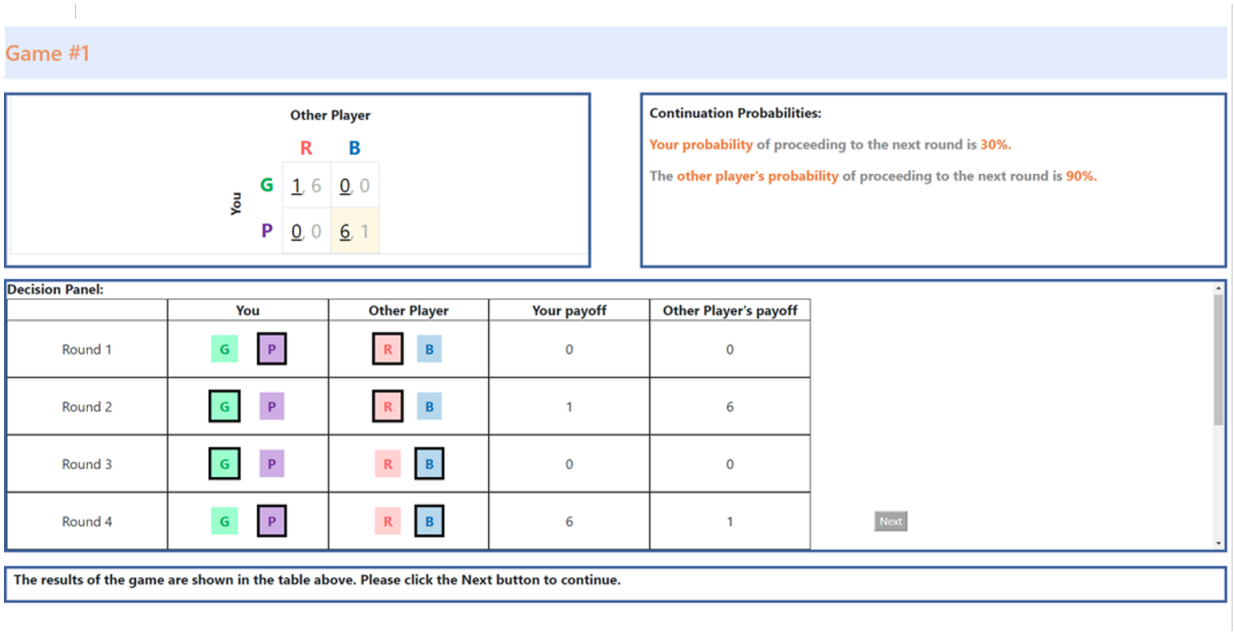
Game Length	Player A	Player B
1	70%	10%
2	21%	9%
3	6.3%	8.1%
4	1.9%	7.3%
5	0.6%	6.6%
6	0.2%	5.9%
7	0.05%	5.3%
8	0.02%	4.8%
9	0.005%	4.3%
10	0.001%	3.9%

Example 1



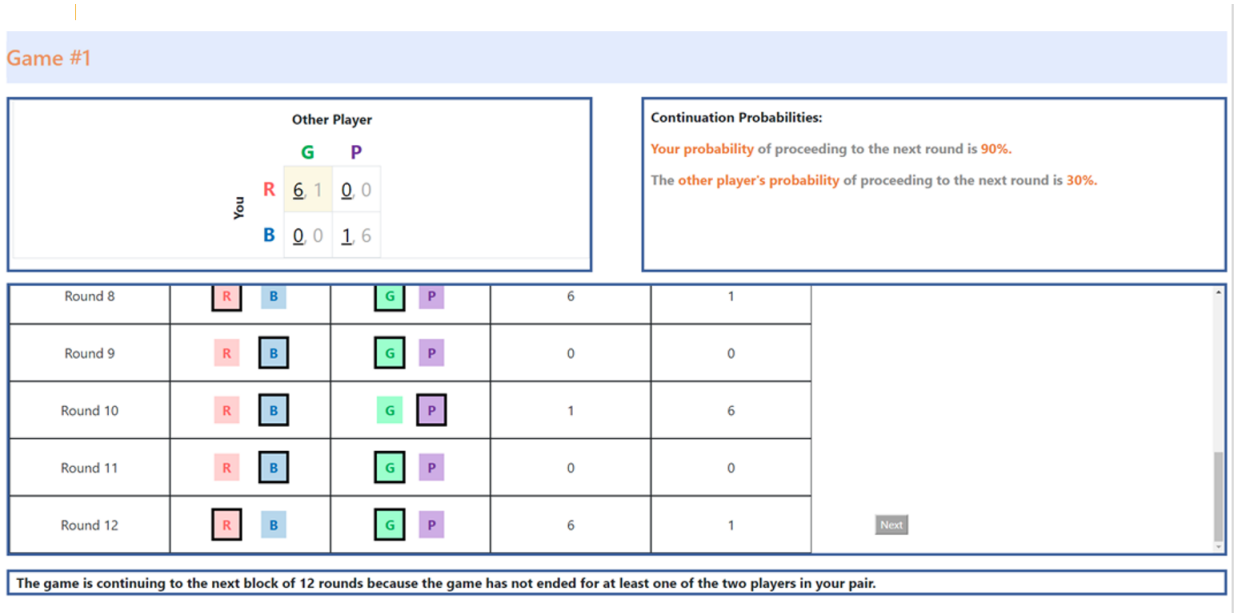
- This is the beginning of a block. You choose your desired action by clicking on its corresponding button.

Example 2



- This is Round 4 of a block. You will be informed of actions chosen in all previous rounds.

Example 3



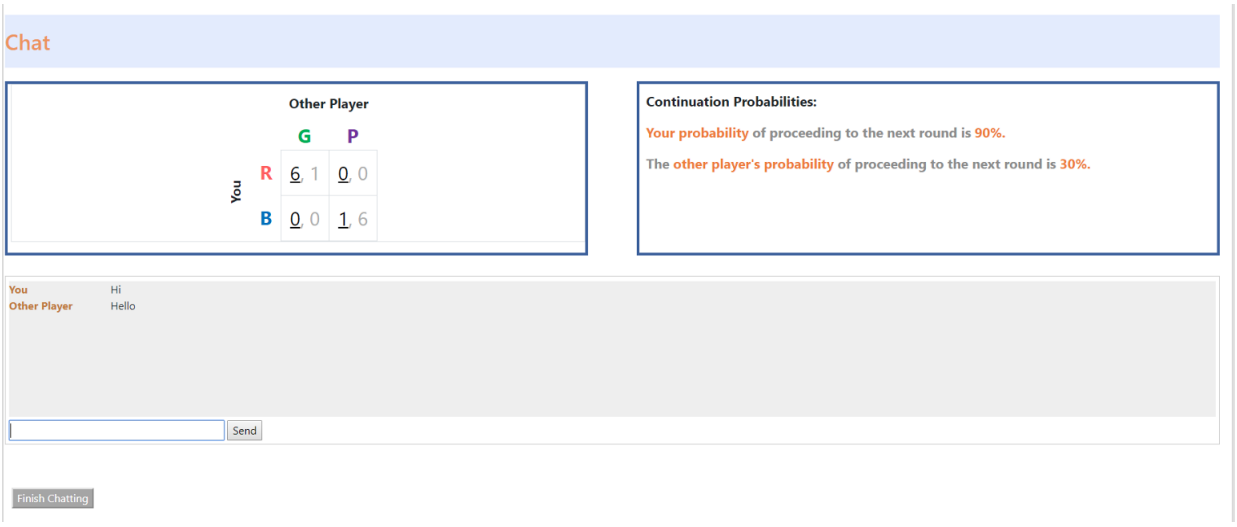
- This is an example of continuation to another block of 12 rounds.

Summary - Active Rounds

- You will continue playing in blocks of 12 as long as the game has not ended for both players in your pair.
- In each round, Player A has a probability of 30% (90%) of continuing the game to the next round.
- In each round, Player B has a probability of 90% of continuing the game to the next round.

Chatting Opportunity

- At the beginning of each game, you will have an opportunity to chat with the participant you are paired with.
- Your messages will only be shown to you and the other participant. To send a message, you type it in and press the "Send" key.
- Please limit your messages to discussions of the current game. You can send as many messages as you want.
- If either person clicks the "Finish chatting" key, chatting will end. Once chatting is over, you will automatically proceed to the first round of a game.



Overall Game Payoffs

- In each game, you will be paid the sum of all round payoffs before the game ends for you.
- You and your paired participant may be paid for different rounds if the game ends sooner for one of you.
- For instance, if a game has ended in round 3 for you, and in round 5 for your paired participant, you will obtain payoffs until round 3 and your paired participant will obtain payoffs until round 5.
- ***You will NOT receive any payoff from rounds you play after the game ends.***

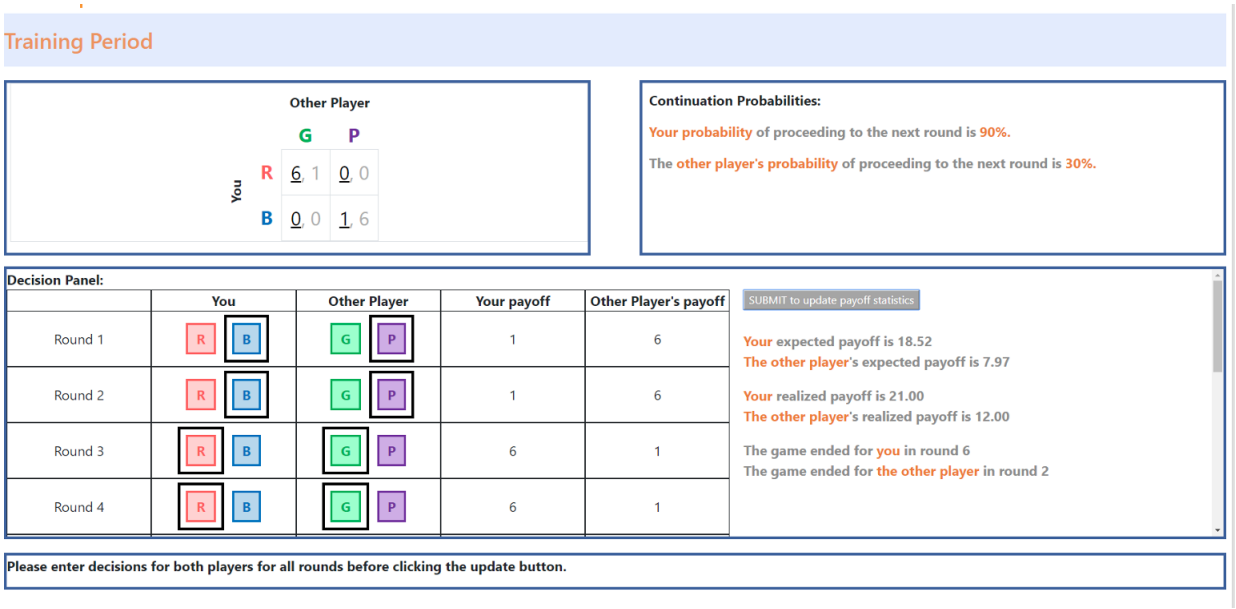
Game End

- Once a game ends, you will be randomly assigned a new label and paired with another participant with a different label for a new game.
- You will not be able to identify who you've interacted with in previous or future games. There will be 10 games in total.

Training Period

- Before the first game begins, you will have an opportunity to explore possible payoffs for you and the other participant in the game.
- Payoffs from the training period do not count towards your payment.
- In the training period, you can specify actions for you and your paired participant, and see the resulting payments.

- "Expected payoff" is the overall payoff you can expect to receive before the length of the game is determined.
- For instance, if you are Player A, the expected payoff from round 4 is 0.3x0.3x0.3xPayoff, and so on. (For instance, the expected payoff from round 4 is 0.9x0.9x0.9xPayoff, and so on.)
- "Realized payoff" is the sum of payoffs from rounds that are randomly chosen to account for your payment once the length of a game is determined.
- For instance, suppose that your game ends in round 7. Then, your realized payoff is the sum of your payoffs in the first seven rounds.



- Whenever you click "Submit to update payoff statistics" key, the realized length of a game is determined afresh → realized payoffs may differ even if you have not changed any action for a round.

Overall Structure and Payments

- At the end of the experiment, your payment will be the sum of payoffs from all 10 games (other than the training period).
- Your payoffs will be converted to dollars at the rate of $7.50 for every 100 points earned (100 points = $7.50).
- You will also be asked to complete several simple tasks at the end. You can earn additional money based on your decisions in these tasks.

Your Earnings

- Your total earnings in the experiment are the sum of the following items:
  - $10 show-up payment
  - payoff from all 10 games: 100 points = 7.5 dollars
  - payoff from the simple tasks: 100 points = 1 dollar
- You need not tell any other participant how much you earned.

Let the Experiment Begin!

- If there are no questions, we will now begin the actual experiment.

G.2 Risk Elicitation Tasks

Investment in a Risky Project 1

- You will be paid for one of the following two tasks. The task you will be paid for will be chosen at random at the end of the session.
- You are endowed with 200 tokens. You can choose to invest any amount between 0 and 200 tokens in a risky project (rounded to the nearest token).
- Tokens that are not invested in the risky project are yours to keep.
- The risky project has a 50% chance of success.
- If the project is successful, you will receive 2.5 times the amount you chose to invest.
- If the project is unsuccessful, you will lose the amount invested.
- Please choose the amount you would like to invest in the risky project. Note that you can pick any amount between 0 and 200 tokens, including either 0 or 200 tokens.
- For these tasks, each token corresponds to one cent, so that 200 tokens correspond to $2.
- I will invest (from 0 to 200) – – – – – tokens

Investment in a Risky Project 2

- You will be paid for one of the following two tasks. The task you will be paid for will be chosen at random at the end of the session.
- You are endowed with 200 tokens. You can choose to invest any amount between 0 and 200 tokens in a risky project (rounded to the nearest token).
- Tokens that are not invested in the risky project are yours to keep.
- The risky project has a 40% chance of success.
- If the project is successful, you will receive 3 times the amount you chose to invest.
- If the project is unsuccessful, you will lose the amount invested.
- Please choose the amount you would like to invest in the risky project. Note that you can pick any amount between 0 and 200 tokens, including either 0 or 200 tokens.
- For these tasks, each token corresponds to one cent, so that 200 tokens correspond to $2.
- I will invest (from 0 to 200) – – – – – tokens

G.3 Altruism Tasks

GENERAL INSTRUCTIONS FOR THE NEXT TWO TASKS.

- For the next two tasks, we have randomly divided the participants in this session into two groups: half of the participants were assigned the role of **proposers** and the other half the role of **responders**.
- Your role will remain fixed for the next two tasks. However, you will not know which role you were assigned.
- In each of the next two tasks, all participants will be randomly divided into pairs. with one proposer and one responder in each pair. After you complete the first task, you will be randomly assigned to a new pair, again with one proposer and one responder in the pair. **You will not be matched with the same partner.**
- As you will see in a moment, responders have no action in the game. Therefore, we will ask all participants in this session what they would like to do if they turn out to be a proposer. At the end of the experiment, the action specified by the subjects who were assigned the role of proposers will determine their payoff and the payoff of the responder who is matched with them.

Dividing Points 1

- If you are a proposer you will have 200 tokens (corresponding to $4) to divide between you and the responder. Specify below how you would like to split 200 tokens it you are indeed a proposer.
- Amount for you: – – – – – (in tokens)
- Amount for responder: – – – – – (in tokens)

Dividing Points 2

- If you are a proposer you will have 100 tokens (corresponding to $1) to divide between you and the responder. Specify below how you would like to split 100 tokens it you are indeed a proposer.
- Amount for you: – – – – – (in tokens)
- Amount for responder: – – – – – (in tokens)

References

Gillen, B., E. Snowberg, and L. Yariv (2019). Experimenting with measurement error: Techniques with applications to the caltech cohort study. *Journal of Political Economy 127*(4), 1826–1863.