

Online Appendix for “Rituals of Reason: Experimental Evidence on the Social Acceptability of Lotteries in Allocation Problems”

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A Pre-registered Analysis of Experiment 2

The experiment was run on August 14, 2023, using Prolific on a representative sample of 600 USA residents. The experiment was pre-registered, the pre-registration is available at <https://aspredicted.org/3yy5p.pdf>.

We have removed from the original output of the data the Prolific IDs, that are used for payments. We ensure therefore that the data is anonymous. We also remove some columns we do not use in the analysis and rename some others. Finally, as we have said in the pre-registration, we remove participants who have not finished the experiment.

A.1 Analysis

A.1.1 Size of the Treatments

In total 577 participants finished the experiment. The target was 300 in each treatment, but due to the unavoidable drop we are below but close to the target.

A.1.2 Non-lottery vs Lottery Procedures

We run the first analysis with all subjects (including those who state indifference).

Table 2 shows that in both cases, participants chose the *Lottery* less often than the non-lottery procedures. The Rock, Paper, Scissors result is in the direction we expected, whereas we did not expect the Time result to be significantly different from 50%. Given the difference in the proportion between the RPS and Time rituals, we can nevertheless test if the proportions are equal or not.

Using a Fisher exact test, we find that the P-value of the odd ratio being equal to 1 is <0.001 . The proportions are significantly different: as expected, our participants chose RPS more often than Time.

Table 1: Number of subjects in each treatment.

Treatment	Participants
Rock, Paper, Scissors	291
Time	286

Table 2: Proportion of the non-lottery procedure being chosen in each treatment.

Treatment	Non-lottery Chosen	P-value ¹
Rock, Paper, Scissors	78%	<0.001
Time	55.9%	0.044

¹ P-value of the one sample two-sided t-test of equality with 50%.

Table 3: Number of subjects and strength of the preference.

Treatment	Procedure Chosen	Preference		P-value ¹
		Indifferent	Strict	
Rock, Paper, Scissors	DC-5 Lottery	4	60	0.517
Rock, Paper, Scissors	Rock, Paper, Scissors	10	217	0.517
Time	DC-5 Lottery	3	123	0.324
Time	Time	1	159	0.324

Note: A preference is considered strict if the WTA is non-null.

¹ P-value of the Fisher exact test of equal proportion.

A.1.3 Removing Indifferent subjects

We say that a subject is indifferent if they state that the minimal amount we should pay them to change their choice is \$0.

Table 3 shows that a very large majority of subjects have strict preferences. These preferences are quite strong, as implied by the distribution of the minimal values asked for in Figure 1. The proportions are not significantly different from each other, as the p-values given in Table 3 indicate.

Another way to think about the strength of preferences is to look at whether subjects give higher WTAs for the non-lottery or lottery procedures. We look at that in Table 5 and the difference between the non-lottery procedure and the lottery are not significant.

Very few subjects report non-null WTA and their choices are not significantly different. For slightly more power and be consistent with earlier experiment we keep subjects with a WTA of \$0.

Table 4: Proportion and P-value of the proportion of the ritual being chosen in each treatment, when excluding indifferent subjects.

Treatment	Non-lottery Chosen	P-value ¹
Rock, Paper, Scissors	78.3%	<0.001
Time	56.4%	0.032

¹ P-value of the one sample two-sided t-test of equality with 50%.

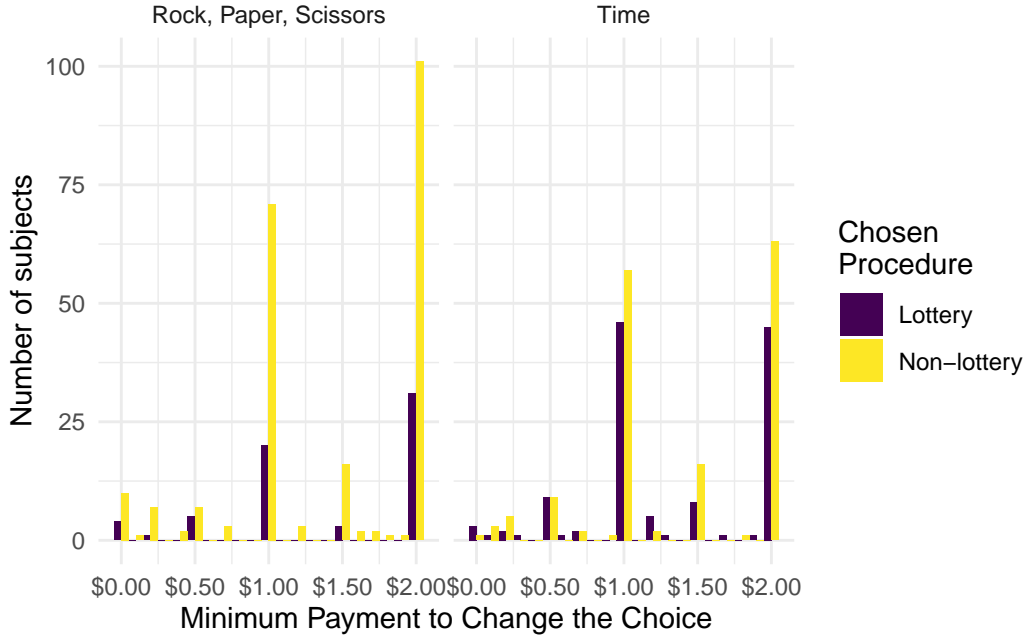


Figure 1: Minimum amount we would need to pay subjects for them to change their choice. Remember that the reward for winning a procedure is \$2.

Table 5: Average WTA by procedure.

Treatment	Chosen Procedure	Average WTA	P-value ¹
Rock, Paper, Scissors	Lottery	\$1.39	0.891
Rock, Paper, Scissors	RPS	\$1.41	0.891
Time	Lottery	\$1.32	0.456
Time	Time	\$1.37	0.456

¹ P-value of the t-test of equality of the WTA between the lottery and non-lottery procedures.

A.1.4 Beliefs

Table 6 shows some overall overconfidence, as more than 50% of subjects believe they will win in either the non-lottery or the lottery. To see if beliefs influence choices, we can look at the subjects who believe they will win in the non-lottery but not in the lottery and the reverse. If beliefs are the only driver of choices, then the first group should always choose the non-lottery, and the second group should always choose the lottery. Table 7 shows that it is not the case. P-value of the Fisher test shows that beliefs have only a minor influence as well.

A.1.5 Time spent in the experiment

We look at the time spent looking at each procedure. We have the time in the pages order by page. The first page is the welcome page. The second page is the first procedure, while the third is the second procedure. The third page is the vote between the procedures. The fourth the WTA question. The fifth and sixth the beliefs over winning or losing the procedures, in the same order as the choice between procedures.

Table 6: Percentage of subjects who believe they win in the lottery or the non-lottery.

Treatment	Winning in non-lottery	Winning in Lottery
Rock, Paper, Scissors	72.5%	56.0%
Time	62.9%	53.5%

Table 7: Percentage of subjects who choose the non-lottery conditional on their beliefs of winning in non-lottery but not the lottery and the reverse. P-value of the proportions being the same.

Procedure	Subjects expect to win only in		
	Non-lottery	Lottery	P-value ¹
Rock, Paper, Scissors	84.9%	63.2%	0.010
Time	63.8%	45.2%	0.117

Note: The first column represents subjects expecting to win in the non-lottery procedure but not in the lottery, the second column the reverse.

¹ P-value of the Fisher test of the proportions of subjects who believe they will win in one procedure but not the other who choose the non-lottery procedure being equal.

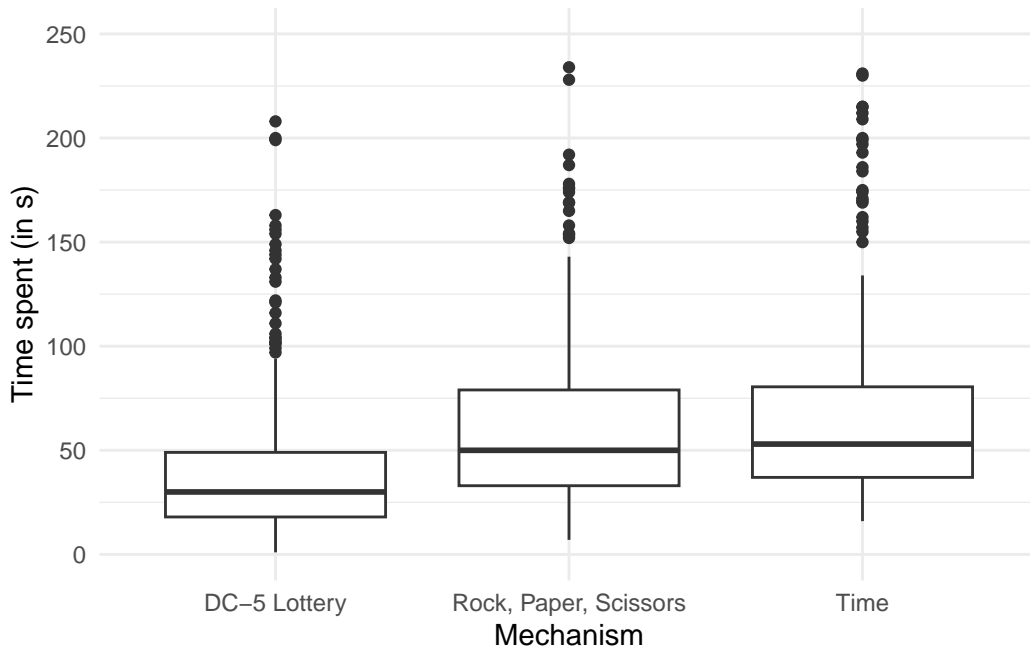


Figure 2: Boxplots of the time spent on the page for the different procedures. Some outliers do not appear on the plots to make the figure readable.

Table 8: Regression analysis of the choice of a non-lottery procedure, depending on the alternative.

	Non-Lottery Chosen	
	Simple	Demographic controls
(Intercept)	0.774*** (0.032)	0.868*** (0.076)
Time	-0.216*** (0.038)	-0.218*** (0.038)
Win in non-lottery ^a	0.077+ (0.045)	0.076+ (0.046)
Win in Lottery ^a	-0.126* (0.060)	-0.131* (0.060)
Male		-0.045 (0.038)
Employed full-time		0.002 (0.045)
White		-0.067 (0.046)
Age		0.000 (0.001)
Num.Obs.	577	577
R2	0.070	0.076
R2 Adj.	0.065	0.065

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

^a Win in XX is a dummy for when a subjects believe they win the XX procedure and NOT in the alternative one.

The median participant spent 5min and 11s in the experiment.

Figure 2 shows that the time spent on the page for the non-lottery do not differ much from each other. The median time for RPS is 50s, whereas it is 54s for Time. The distribution of time spent are not significantly different from each other, as the P-value of an the Kolmogorov-Smirnov test of the values being drawn from the same distribution is 0.165. The median time spent on the DC-5 Lottery screens is 30s. The shorter time spent on the lottery is expected, as they only have to read the description of the procedure and do not have to think about what to do in the procedure.

A.1.6 Regression Analysis

Finally, we perform a regression analysis in Table 8. The results show the share of subjects who chose a non-lottery. The baseline is given with Rock, Paper, Scissors. We can see that Time decrease the share of non-lottery chosen compared to lottery. Believing that you will win the lottery but not in the non-lottery decrease the share of non-lottery chosen, whereas the opposite is true if you believe you will win in the non-lottery but not in the lottery.

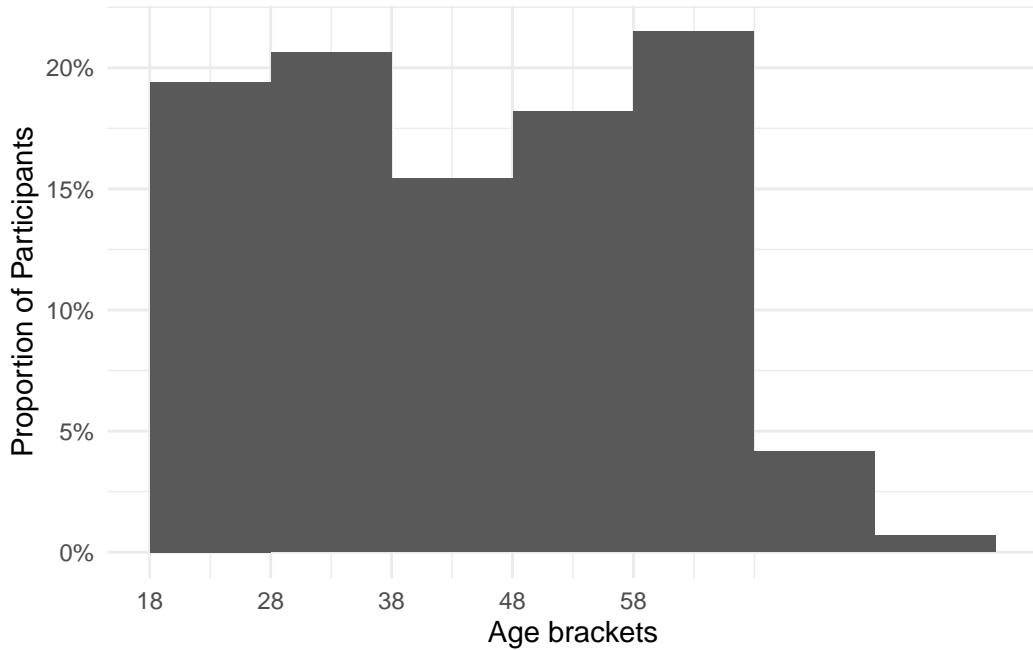


Figure 3: Histogram of the age groups in the sample.

Table 9: Declared ethnicity in the sample.

Declared Race	Count
Asian	36
Black	76
Mixed	12
Other	6
White	447

A.2 Demographics

52.5% of participants in the sample are female. Figure 3 represents the repartition of the different age using Prolific stratification strategy. Table 9 shows a the repartition of ethnicity using Prolific stratification strategy.

B The algorithm for *Time*

We show here the version with control of the arbitrary algorithm used in our *Time* procedure.

We will ask you to choose a time (in 24 hours format). For each player we will record the five last digits, that we denote as your “code”. For instance, 10 hours, 26 minutes and 31 seconds become “02631”.

We have developed an algorithm ranking all participants based on their code (We expect around 100 participants today). Among others, it takes into account whether your code is above or below the median. You can read the details of the algorithm by clicking on this button.

The details below are hidden by default, but can be revealed by clicking on a button.

We use the following algorithm to rank the codes:

1. We will count for all the players in the experiment the number n of odd digits of the code, with 0 counting as even. In the example, the number of odd digits is $n = 2$.
2. We will then rank everyone according to the number n (a higher n yield a higher rank). We call this rank your "code rank".
3. For the tied players with the same number n of odd digits, we rank them by the statistical frequency of the first digit of the "code". We will give a higher rank to those with the lowest frequency, then to the second lowest one, until there are no more number left (tied frequencies are bundled together). If there is still a tie, we repeat the same procedure with the second digit of the code. And so till the last digit.
4. We then determine the winner as follows:
 - CASE 1: If strictly more players have $n < 2.5$ than $n > 2.5$ (i.e., if the median is below 2.5): your award rank is the same as your code rank. All the 50% higher ranked players in the award rank win the reward.
 - CASE 2: If strictly fewer players have $n < 2.5$ than $n > 2.5$ (i.e., if the median is above 2.5): your award rank is the revert of the code rank. If there are N participants and your code rank was j , then your award rank is $N+1-j$. All the 50% higher ranked players in the award rank win the reward.
5. In the unlikely event that a tie remains at the end of the procedure, exactly at the 50% mark, all tied players will receive a reward.

C Screenshots

C.1 Experiment

In this section, we show the screenshots of the different pages of Experiment 2. Each screen appeared once, except that only one of Time or RPS was shown. Beliefs were elicited for Time in the same way as for RPS. The experiment was programmed using oTree (Chen, Schonger, and Wickens 2016). The screens were very similar for Experiment 1, with three important differences. First, we did not ask for the intensity of their preferences. Second, we had demographic questions that we do not need in this experiment, as they are provided by Prolific. Third, we elicited ambiguity attitudes in Experiment 1.

Welcome!

Thank you for participating in this experiment! You will receive a payment of at least \$1.00 for your participation. You are in a group of 100 participants for this experiment.

The experiment is divided into three stages. Your choices in each of these stages may increase your total earnings.

1. In the first stage, you will choose five actions in a Rock-Paper-Scissors game (RPS hereafter).
2. In the second stage, you will choose between two options that may give you a reward of \$2.00. Your chances of getting the reward will depend on your choices in stage 1.
3. In the third stage, we will ask you some questions regarding your previous choices. By answering these questions, you may earn \$0.20.

For transparency, once we have computed the results and anonymized the choices, we will send you a personal code and a website link through Prolific.

Please note that once you have clicked the next button on a page, you won't be able to go back and change your answers. In other words, once validated, your answers are definitive.

Next

The First Mechanism: Rock, Paper, Scissors

Your Actions

Rules

Rock, Paper, Scissors (RPS) is a game originating from ancient China. Its rules are simple. You have to choose one of three actions: Rock, Paper or Scissors. Your opponent also has to choose one of these three actions. Then:

- Rock smashes Scissors;
- Scissors cuts Paper;
- Paper covers Rock;
- If both of you choose the same action, it is a tie.

We ask you to provide us with a sequence of 5 actions of RPS. At the end of the day, we will play your actions against all 99 other members of your group. The game will be such that each time your first action is pitted against your opponent's first action, your second action against their second action, and so on. The rules for winning are simple: each time your action beats the opponent's action, you gain 1 point. If your action is beaten, however, you lose 1 point. In case of a tie, nothing happens.

The points are then summed up, you win if:

- You have a positive number of points, which means you have won more often than your opponent;
- Your number of point is null (i.e., you and your opponent have won the same number of rounds) and you have won the tie breaking rule.¹

We will then rank all participants according to the number of wins. In case of tie, we use the result of the games among tied players only.

For the first round, which action do you want to choose?

- Rock
- Paper
- Scissors

For the second round, which action do you want to choose?

- Rock
- Paper
- Scissors

For the third round, which action do you want to choose?

- Rock
- Paper
- Scissors

For the fourth round, which action do you want to choose?

- Rock
- Paper
- Scissors

For the fifth round, which action do you want to choose?

- Rock
- Paper
- Scissors

Next

¹: The winner of the tie-breaking rule is the first winner of a round.

²: In the unlikely event where tied players have chosen exactly the same strategy, we use a tie-breaking procedure based on your time of arrival. You can find the details [here](#).

The Second Mechanism: Time

Rules

We will ask you to choose a time (in 24 hours format). For each player we will record the five last digits, that we denote as your "code". For instance, 10 hours, 26 minutes and 31 seconds become "02631".

We have developed an algorithm ranking all 100 players of your group based on their code. Among others, it takes into account whether your code is above or below the median. You can read the details of the algorithm by clicking on this button.

Details

Your Choices

Please choose your hour:

Please choose your minutes:

Please choose your seconds:

Next

The Second Mechanism: DC-5 Lottery

Your Code

Our algorithm has generated the following code for you: **Odd, Odd, Even, Even, Odd**.

Rules

It is a bet over whether each of the 5 numbers of the day after tomorrow's draw of the [DC-5 Lottery](#) is either Odd or Even (the draw of the November 17, 2023 at 12.50PM, in Washington DC time zone).

For each number, you get one point if your code is correct. We will rank all 100 members of your group by the number of points they got.

If you are among the first half, you win. If you are among the second half, you lose.¹

Next

¹: If there is a tie among players, we will look first at those who got the first digit right. Then, if there is still a tie, the second only, etc. In the unlikely event that a tie remains at the end, we use a tie-breaking procedure based on your time of arrival. You can find the details [here](#).

Choosing the Mechanism

The next two pages

One of the next two questions will be used to determine which mechanism determines the allocation of the reward to the 100 players of your group.

We have attributed unique personal numbers between 0 and 99 to all players in your group. Your number is **71**. If your number is drawn the day after tomorrow by the mid-day [DC-2 lottery](#) (the draw of the November 17, 2023 at 12.50PM, in Washington DC time zone), we will use your chosen mechanism to determine the rewards in your group. Otherwise, we will use the mechanism chosen by the player whose number was drawn by the lottery. If the first number of the day after tomorrow's mid-day [DC-3 lottery](#) is below 5 (if it is 0, 1, 2, 3 or 4), then we will use this question to determine the mechanism. Otherwise, we will use the next question.

You can now choose whether you prefer to get a chance to win the reward of \$2.00 according to:

- The results from your RPS sequence of actions.
- The results of your 5 digits code against tomorrow's DC-5 Lottery.

In both cases, **you win if you are among the first half of all participants in your group.**

Which mechanism do you choose?

- Rock, Paper, Scissors
- DC-5 Lottery

Next

Changing your choice?

In the previous page, you chose the Rock, Paper, Scissors to allocate the rewards of \$2.00 to the participants in your group. In this page, you may earn an additional amount of up to \$2.00.

What is the minimal amount we should pay you to change your choice?

\$

We have built the payments so that it is in your best interest to tell us truthfully what is the minimal amount we should pay you to change your choice. The details are accessible when clicking on the link below.

Details

If the first number of the day after tomorrow's mid-day [DC-3 lottery](#) is 5 or above (if it is 5, 6, 7, 8 or 9), then we will use this question to determine the mechanism. Otherwise, we will use the previous question. If this question is used and your number is drawn in the day after tomorrow's DC-2 mid-day lottery, here is how it works.

First, we use the number of the day after tomorrow's mid-day [DC-3 lottery](#), which is comprised between 0 and 999 and divide it by 200. The rest of this division is the threshold amount (in cents).

- If the threshold amount is lower than the amount you gave us above, we will use Rock, Paper, Scissors (the choice you made in the previous page).
- If the threshold amount is higher than the amount you gave us, we pay you the threshold amount, and we will use the DC-5 Lottery.

Next

Winning in Rock, Paper, Scissors

One of the next three questions will be randomly selected for payment.¹

If this question is selected for payment, you can earn an additional \$0.20 if your guess is correct (and \$0.00 otherwise).²

You have the sequence of actions in Rock, Paper, Scissors: **Rock, Paper, Scissors, Rock, Rock**. We will rank your performance according to the algorithm described [here](#). We will play your sequence against all other members of your group and rank all the participants according to the sequence.

Do you think you will be ranked among the:

Bottom half	Top half
<input type="radio"/>	<input type="radio"/>

Next

¹: To determine the question used for payment, we add one to the rest of the division of the number drawn by the [DC-4 Lottery](#) of the day after tomorrow at mid-day (the draw of November 17, 2023 at 12.50PM).

²: If you are ranked exactly in the middle, you will earn the reward no matter which option you choose.

Winning in DC-5 Lottery

If this question is selected for payment, you can earn an additional \$0.20 if your guess is correct (and \$0.00 otherwise).²

Your sequence of guesses for the DC-5 lottery is **Odd, Odd, Even, Even, Odd**. We will rank its performance in guessing the DC-5 lottery results against all other codes of members of your group, according to the algorithm described [here](#).

Do you think you will be ranked among the:

Bottom half	Top half
<input type="radio"/>	<input type="radio"/>

Next

²: If you are ranked exactly in the middle, you will earn the reward no matter which option you choose.

Winning the Reward

If this question is selected for payment, you can earn an additional \$0.20 if you guess in which mechanism you are ranked higher (and \$0.00 otherwise).¹

We have previously described to you two mechanisms, the DC-5 Lottery (details [here](#)) and Rock, Paper, Scissors (details [here](#)).

Do you think your rank will be higher in?

- DC-5 Lottery
- Rock, Paper, Scissors

Next

¹: If you have exactly the same rank in both mechanisms, you will earn the reward no matter which mechanism you choose.

Understanding your choices

We would like to better understand your choices, the following questions have no right or wrong answer.

Why did you choose the Rock, Paper, Scissors to get your reward?

- I think I have more chances of winning in this mechanism.
- I prefer this mechanism, but for other reasons.

If you wish, you may explain in more details your choice.

Do you agree or disagree with the following statements.	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Rock, Paper, Scissors is more meritocratic than DC-5 Lottery.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rock, Paper, Scissors is fairer than DC-5 Lottery.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rock, Paper, Scissors is easier to understand than DC-5 Lottery.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Next

Thank You!

You have completed this experiment, thank you for participating!

Your reward will be paid on your Prolific account in the next 4 days, after the lotteries are drawn and the mechanisms played accordingly. The anonymized results will be available on the website <https://eliasbcd.github.io/experiment/experiment1.html>.

Your personal code is **9h8assid**. We will send you the detailed payments and personal code through an email to your Prolific account. **To tell us (and Prolific) that you have completed the experiment, please click [here](#).**

C.2 Results

We publicly showed the anonymized results of the experiment. First we show a screenshot for the result in Experiment 1, then a screenshot for the results in Experiment 2.



Experiment 1

The painting possible choices are as follow.
blabla

Experiment 1

Participant Code	Payment	Paintings Choices	Lottery Choices	Mechanism	Lottery Ranks	Painting Ranks	Criteria Belief	Lottery Belief	Best Mechanism	Urn Winner	Colour Drawn	Colour
tmoi1aja	1.8	[0, 0, 0, 0, 1]	[1, 1, 0, 0, 1]	Guessing the Paintings	1	1	Top half	Bottom half	Guessing the Paintings	1	Black	Black
k395y5u4	1.7	[1, 0, 1, 1, 1]	[1, 0, 0, 1, 0]	Guessing the Paintings	2	2	Top half	Neither	Guessing the Paintings	0	Red	Black
y36q4f4h	0.7	[1, 1, 0, 0, 1]	[0, 1, 1, 0, 1]	Guessing the Paintings	3	4	Neither	Bottom half	DC-5 Lottery	0	Black	Red
nf7ojcal	0.5	[0, 1, 0, 1, 1]	[0, 1, 0, 1, 0]	Guessing the Paintings	4	3	Top half	Neither	DC-5 Lottery	0	Black	Red

Results from Experiment 1

You can find here the results from Experiment 1 carried on by Renaud Foucart and Elias Bouacida.

The different draws of the DC-Lottery of August 16 at 12.50pm are:

- DC-2: 4, 9. The participant number selected is 49;
- DC-3: 3, 2, 8, the rest in the division by 200 is 128, which is the threshold amount (in cents). The first number is below 5, so the question used is the first (and the threshold amount does not matter).
- DC-4: 9, 6, 6, 6, so the rest in the division by 3 is 0 and the question for predictions selected is the first one.
- DC-5: 7, 8, 8, 5, 4, so the sequence to match is Odd, Even, Even, Odd, Even.

Due to a mistake in the implementation of the experiment, you are in group of approximately 50 participants, instead of the 100 originally intended. In each group, the mechanism chosen to compute the reward may be different.

The selected mechanism to attribute the reward in Group 1 is Rock, Paper, Scissors. The choices of all members of Group 1 are below.

About You			About the Mechanisms						Predictions		
Code	Number	Payment	Lottery Sequence	RPS Sequence	Your Choice	Your Threshold	Lottery Ranks	RPS Ranks	RPS	Lottery	Mechanism Preferred
gpyun1b2	70	\$3.20	Even, Even, Even, Even, Odd	Paper, Paper, Paper, Paper	Rock, Paper, Scissors	\$0.41	30	1	Top half	Bottom half	Rock, Paper, Scissors
fni7ptzq	37	\$3.00	Even, Odd, Odd, Odd, Odd	Paper, Scissors, Paper, Rock, Rock	Rock, Paper, Scissors	\$1.00	45	2	Top half	Top half	Rock, Paper, Scissors
1frnbpdj	6	\$3.20	Odd, Even, Even, Odd, Even	Paper, Rock, Scissors, Rock, Paper	Rock, Paper, Scissors	\$1.00	1	3	Top half	Top half	DC-5 Lottery

References

Chen, Daniel L., Martin Schonger, and Chris Wickens (2016). “oTree—An open-source platform for laboratory, online, and field experiments”. In: *Journal of Behavioral and Experimental Finance* 9, pp. 88–97. ISSN: 2214-6350. DOI: 10.1016/j.jbef.2015.12.001.