

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

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A Intensity of Preferences in Experiment 1

We only elicited our subjects’ willingness to pay to change their choice in Experiment 1. We estimate that a subject is indifferent if they state a \$0 minimal value for changing their choices.

Table 1 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 proportion of the non-random procedure being chosen are not significantly different with or without indifferent subjects. Fisher exact tests of equality of proportion gives a P-value of 1 in the case of *RPS* and of 0.933 in the case of *Time*. Table 2 shows that the proportions are always significantly different from 50%, showing that there is a majority of subjects favoring one procedure over the other (in general the non-random one).

B Demographics

Table 3 shows the gender repartition in Experiment 1 and 2. There are a lot more males in Experiment 2, whereas Experiment 1 is representative in terms of gender, as expected. Table 4 shows the repartition by age group in Experiment 1 and 2. As Experiment 1 is made on a representative sample of the USA population, it shows that Experiment 2 is

Table 1: Number of subjects and strength of the preference.

Non-random	Procedure	Preference	
Procedure	Chosen	Indifferent	Strict
RPS	Lottery	4	60
RPS	RPS	10	217
Time	Lottery	3	123
Time	Time	1	159

Note:

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

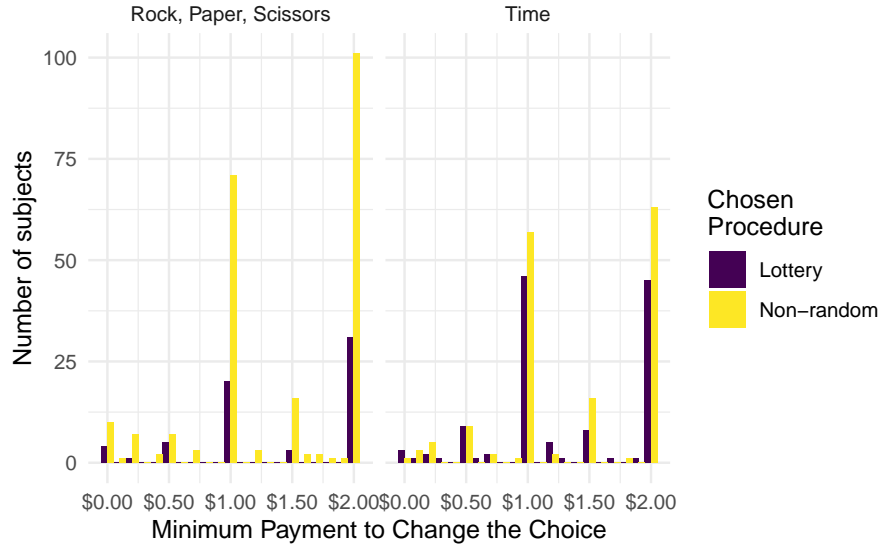


Figure 1: Minimum amount we would need to pay subjects for them to change their choice. The reward for ranking among the first half of the chosen procedure is \$2.

Table 2: Proportion of the non-random procedure being chosen in each treatment, when excluding indifferent subjects.

Procedure	Non-Random Chosen	P-value ¹
Experiment 1		
RPS	78%	<0.001
Time	55.9%	0.044
Experiment 2		
RPS	61.8%	<0.001
Paintings	59.8%	<0.001
Time	43.4%	0.008

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

Table 3: Proportion of subjects of each gender in both experiments.

Gender	Experiment 1	Experiment 2
Female	52.5%	38.8%
Male	47.5%	61.2%

Table 4: Proportion of subjects in each age group for each experiment.

Age Group	Experiment 1	Experiment 2
<25	13.9%	3.5%
25-40	28.9%	64.6%
40-55	25.8%	23.2%
>55	31.4%	8.2%
Prefer not to say	-	0.5%

Note:

Age group used are those elicited in Experiment 2.

far from representative in terms of age. Table 5 shows the repartition of ethnicity using Prolific stratification strategy.

We report the self-declared country of residence of the subjects in Experiment 1 and 2 in Table 6. The majority of our subjects report coming from the United States (79.3%) in Experiment 2. The second highest country of residence is India (12.2%).

C Regression analysis

We perform a linear regression analysis of the choice of the non-random procedure in both experiments in Table 7. The coefficients represents variations (in percentage points) of the share of subjects who chose a non-random procedure. The baseline is given with *RPS* with control and *Lottery* without control. We find that the procedures following the rituals of reason are indistinguishable from each other, whereas the arbitrary one (*Time*) is less chosen (22 percentage points in Experiment 1). Control matters more for the lottery than for the non-random procedures. It increases the choice of the lottery by around 10 percentage point, and the absence of control over the non-random procedures by 5 percentage points. For some subjects, the belief that they will win in one of the procedure and not the other drives their choices. It represents a fraction of around 20 percent of the sample. There is however no correlation between the expected relative

Table 5: Declared ethnicity in Experiment 1

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

Table 6: Number of subjects from each country in both experiments.

Country	Experiment 1	Experiment 2 ¹
Asian	-	0.2%
Brazil	-	4.2%
Bulgaria	-	0.1%
Canada	-	0.5%
Columbia	-	0.1%
France	-	0.3%
Germany	-	0.3%
India	-	12.2%
Italy	-	1.5%
Portugal	-	0.1%
Spain	-	0.2%
Sweden	-	0.1%
The Netherlands	-	0.1%
Turkey	-	0.1%
UAE	-	0.2%
USA	100%	79.3%
Ukraine	-	0.1%
United Kingdom	-	0.5%

¹ In Experiment 2, the country is residence is self-declared. We have tried to reconstruct the country from their declaration, but it was sometimes difficult.

Table 7: Regression of the choice of the non-random procedure.

	Non-random Procedure Chosen			
	Experiment 1		Experiment 2	
(Intercept)	0.780 (0.032)	0.848 (0.070)	0.695 (0.032)	0.699 (0.078)
Time	-0.221*** (0.038)	-0.223*** (0.038)	-0.190*** (0.033)	-0.191*** (0.033)
Paintings			-0.028 (0.032)	-0.024 (0.032)
Win in Non-Random ^a	0.077+ (0.045)	0.076+ (0.046)	0.114*** (0.033)	0.112*** (0.033)
Win in Lottery ^a	-0.126* (0.060)	-0.132* (0.060)	-0.099** (0.035)	-0.098** (0.035)
Indifferent	-0.127 (0.109)	-0.120 (0.110)		
No Control on Non-Random			-0.053* (0.027)	-0.050+ (0.027)
Control on Lottery			-0.103*** (0.027)	-0.107*** (0.027)
Male		-0.044 (0.038)		0.052+ (0.027)
Demographic Controls ^b	No	Yes	No	Yes
Num.Obs.	577	577	1324	1317
R2	0.073	0.079	0.059	0.065
R2 Adj.	0.066	0.064	0.055	0.058

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

Note:

No demographic control is significant.

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

^b Demographic controls: Age categories, Being White (in Experiment 1)

ranking in the measures and the choice of procedure. This last result is not unexpected, as the only payoff-relevant ranking is whether or not a subject is in the first half of the participants, not the relative ranking.

D Influence of the Given Sequence in the Lottery

It is possible that participants are influenced in their choices by the strategies we choose for them when they have no control over a procedure. For instance, they may believe that the sequence Even, Even, Even, Even, Even or Odd, Odd, Odd, Odd, Odd is less likely to happen than the sequence Even, Odd, Even, Odd, Even. This incorrect understanding of probabilities is more likely to happen when facing the *Lottery*, as there is no particular order for the *Paintings* or for the *Time* procedure. In *RPS*, subjects would have to be

Table 8: Choices of the non-random procedure when subjects have no control over the lottery, by the number of Even in the sequence given to them.

	Number of evens						P-values		
	0	1	2	3	4	5	0~5	1~4	2~3
Experiment 2									
RPS	40.0%	63.6%	65.0%	77.5%	76.9%	50.0%	>0.999	0.234	0.108
Paintings	66.7%	63.4%	70.0%	62.2%	52.2%	75.0%	>0.999	0.433	0.375
Time	28.6%	39.3%	49.2%	54.3%	34.4%	62.5%	0.315	0.791	0.604
Experiment 1									
RPS	88.9%	86.5%	78.6%	78.3%	71.9%	60.0%	0.505	0.139	>0.999
Time	37.5%	53.2%	60.4%	51.7%	56.5%	85.7%	0.119	0.836	0.290
Aggregate	52.5%	61.9%	65.1%	64.9%	61.3%	67.6%	0.237	0.918	>0.999

Note:

P-values of the Fisher exact test of equal proportion in both samples.

sophisticated in their strategies to form a belief about it, and it does not appear to be the case.

To investigate this issue, we restrict ourselves to the sample of subjects without control on the lotteries, which is all participants of Experiment 1 and 678 participants in Experiment 2. We first count the number of Even in the sequence we gave them. Table 8 shows the proportions of subjects choosing each non-random procedure depending on the number of Even in their sequence. The sample sizes vary widely: subjects are much more likely to have a sequence with 3 Even than 5 (even if any given sequence is equally likely).

First we find no difference between the treatment of Odd and Even. There is no significant difference between the share of subjects choosing the non-random procedure when awarded a sequence of 0 or 5 Even. The same holds between 1 and 4 or 2 and 3, respectively, according to a Fisher test of equal proportions. So in Table 8, Odd and Even are treated the same by participants, which is reassuring.

We can therefore group up sequences of 0 and 5 Even together, as well as sequences of 1 and 4 and 2 and 3. It yields to Table 9. The proportions of each non-random procedure being chosen are never significantly different between 0 and 1 or 2 Even in the sequence, according to a Fisher test of equal proportions.

Finally, we run a regression without demographic controls restricted to subjects without control on the lottery. We add dummy for getting 0 or 1 even (or odd) and use as a baseline getting 2 or 3 evens. The results given by Table 10 shows that the given sequence does not significantly influence choices. The significant variables also do not change, and neither do their magnitudes, compared to the coefficients in Table 7 without demographic controls. It means that despite some anecdotal evidence, how the sequence looks may only be marginally taken into account by our participants in their choices of procedure.

Table 9: Choices of the non-random procedure when subjects have no control over the lottery, by the number of Even/odd in the sequence given to them.

Non-random procedure	Number of evens/odds			P-values		
	0	1	2	0~1	0~2	1~2
Experiment 2						
RPS	43.8%	69.9%	70.9%	0.081	0.045	0.882
Paintings	71.4%	59.4%	65.5%	0.548	0.773	0.436
Time	46.7%	36.7%	51.9%	0.558	0.789	0.062
Experiment 1						
RPS	78.6%	77.2%	78.4%	>0.999	>0.999	0.881
Time	60.0%	54.8%	56.2%	0.785	>0.999	0.898
Aggregate	59.5%	61.6%	65.0%	0.795	0.374	0.251

Note:

P-values of the Fisher exact test of equal proportion for each procedure between each number of sequence.

E 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:

Table 10: Choice of the non-random procedure, adding controls for the sequences.

	Non-random Procedure Chosen	
	Exp. 1	Exp. 2
(Intercept)	0.786 (0.035)	0.721 (0.035)
Time	-0.221*** (0.038)	-0.191*** (0.032)
Paintings		-0.030 (0.032)
Win in Non-Random ^a	0.080+ (0.045)	0.109** (0.033)
Win in Lottery ^a	-0.129* (0.060)	-0.103** (0.035)
Indifferent	-0.137 (0.111)	
No Control on Non-Random		-0.052+ (0.027)
Control on Lottery		-0.110*** (0.027)
Sum of Odds or Evens = 0	0.048 (0.089)	-0.078 (0.047)
Sum of Odds or Evens = 1	-0.023 (0.041)	-0.060+ (0.033)
Num.Obs.	577	1324
R2	0.074	0.063
R2 Adj.	0.064	0.057

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

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

- 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.

F Screenshots

F.1 Experiment

In this section, we show the screenshots of the different pages of Experiment 1. 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 programme using oTree (Chen et al., 2016). The screens were very similar for Experiment 2, with two 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.

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](#).**

F.2 Results

We publicly showed the anonymized results of the experiment. Here is a screenshot of one result page.

Results from Experiment 1

You can find here the results from Experiment 1 carried on by [redacted] and [redacted]

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, Paper	Rock, Paper, Scissors	\$0.41	30	1	Top half	Bottom half	Rock, Paper, Scissors
fnl7ptzq	37	\$3.00	Even, 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, D.L., Schonger, M., Wickens, C., 2016. otree—an open-source platform for laboratory, online, and field experiments. *Journal of Behavioral and Experimental Finance* 9, 88 – 97. doi:10.1016/j.jbef.2015.12.001.