

Additional Documentation for ”The Selective Disclosure of Evidence: An Experiment”

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1 Experimental Design

1.1 Graphical Interface

The figures in this section show the software interface of our main experiment, which was designed using the software *oTree* (Chen et al., 2016) and run in the laboratory facilities of New York University and Columbia University. All the details of our design are described in the main body of the paper. We report screenshots of the software for one of our treatments, (K_3, N_{10}) . Figures 1 and 2 show the sender’s screen at the time of selecting her message. Figure 3 shows the receiver’s screen at the time of making her guess. Figure 4 shows the feedback screen.



Figure 1: Sender’s Interface Before the Message Choice

Round 7 of 30: Communication Stage
You are the Sender

Reminder:

If the secret Urn is **Yellow**, this is the probability of each ball being drawn:

A	B	C	D
10 %	20 %	25 %	45 %

If the secret Urn is **Red**, this is the probability of each ball being drawn:

A	B	C	D
45 %	25 %	20 %	10 %

The secret Urn is **Yellow**

Available Balls

0
1
1
5

A

B

C

D

+

+

+

+

-

-

-

-

Your message to the Receiver is:

A

A

B

Send

Figure 2: Sender's Interface After the Message Choice

Round 7 of 30: Guessing Stage
You are the Receiver

Reminder:

If the secret Urn is **Yellow**, this is the probability of each ball being drawn:

A	B	C	D
10 %	20 %	25 %	45 %

If the secret Urn is **Red**, this is the probability of each ball being drawn:

A	B	C	D
45 %	25 %	20 %	10 %

The Sender had 10 available balls and they could disclose 3 or less. This is the Sender's message:

A

A

B

Use the slider below to indicate your Guess of how likely it is that the secret Urn is Red.

Your Guess: 10

Submit

Figure 3: Receiver's Interface

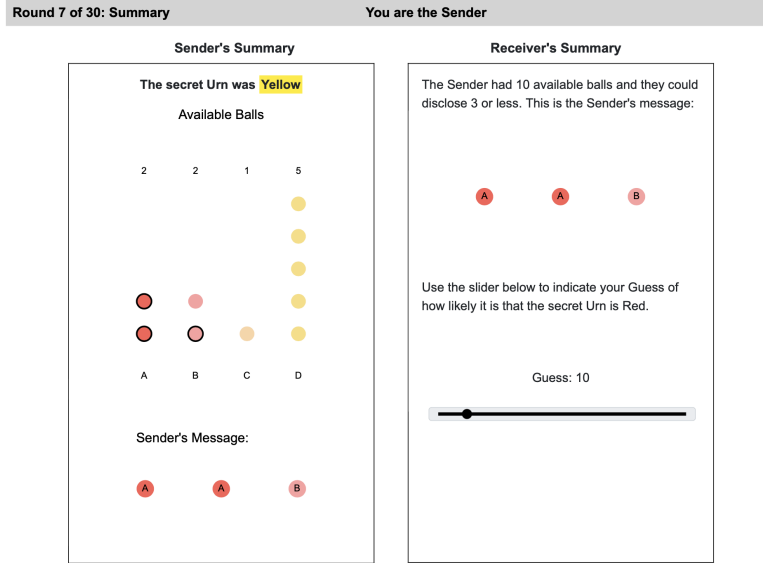


Figure 4: Feedback Interface

1.2 Sample Instructions

We reproduce instructions for one of our treatments, (K_3, N_{10}) . These instructions were read in the laboratory facility at the beginning of each session. Additionally, a copy of the instructions was handed out to the subject, and it was available to them at any point during the experiment.

Welcome

You are about to participate in a session on decision-making, and you will be paid for your participation with cash vouchers (privately) at the end of the session. What you earn depends partly on your decisions, partly on the decisions of others, and partly on chance.

Please turn off phones and tablets now. Please close any program you may have open on the computer. The entire session will take place through computer terminals, and all interaction among you will take place through computers. Please do not talk or in any way try to communicate with other participants during the session.

We will start with a brief instruction period. During the instruction period you will be given a description of the main features of the session and will be shown how to use the computer interface. If you have any questions during this period, raise your hand and your question will be answered privately.

Instructions

You will play for 30 matches in either of two roles: **Sender** or **Receiver**. At the end of each round, you will be randomly paired with a new player.

There are two urns: one **Red** and one **Yellow**. Each urn contains four types of balls, labeled A, B, C, and D.

The Round

At the beginning of each round, the Computer randomly selects one of the two urns (we will refer to the selected urn as secret Urn). The secret Urn has a 50% chance of being Red and a 50% chance of being Yellow.

The Computer randomly draws 10 balls from the secret Urn. Depending on the color of the secret Urn, each ball has a chance of being drawn that is reported in the table below:

Urn	A	B	C	D
Red Urn	45%	25%	20%	10%
Yellow Urn	10%	20%	25%	45%

The 10 balls are drawn independently, meaning that the chance of drawing a ball is not affected by previous draws.

1. Communication Stage—Sender is Active

The sender observes the color of the secret Urn and sees the 10 balls that were drawn from it by the Computer.

The Sender can disclose to the Receiver up to 3 of these 10 balls. We call this the Sender's **Message**.

2. Guessing Stage—Receiver is Active

The Receiver observes the Sender's Message but does not observe the color of the secret Urn.

The Receiver must guess how likely it is that the secret Urn is Red. Specifically, the Receiver chooses a number from 0 to 100. We call this the Receiver's **Guess**.

For example, a Guess of 20 indicates that the Receiver believes there is a 20% chance that the secret Urn is Red. A Guess of 80, instead, indicates that the Receiver believes there is an 80% chance that the secret Urn is Red. More generally, a higher Guess indicates a greater chance that the secret Urn is Red.

3. Feedback

At the end of each round, both Sender and Receiver will see screens that summarize information from the Round. You will learn the color of the secret Urn; the balls that were

available to the Sender; the Message sent by the Sender; the Receiver's Guess; and your payoff. You will also see a history of what happened in previous rounds.

How Payoffs Are Determined

In each round, you earn points that will be converted into cash at the end of the experiment.

Sender

The number of points the Sender earns in a round depends only on the Receiver's Guess and not on the color of the secret Urn. Specifically, the number of earned points is equal to the Receiver's Guess. Therefore, the higher the Receiver's Guess, the greater the number of points earned by the Sender.

Receiver

The number of points the Receiver earns depends on the Guess, on the color of the secret Urn, and on chance. Specifically, the number of earned points is determined as follows:

The Computer randomly generates two numbers between 0 and 100, where each integer number is equally likely. Let's call them the *Computer's Random Numbers*.

The Receiver earns 100 points if one of the following two things happens:

- The secret Urn is Red and the Receiver's Guess is greater than or equal to the smallest of the two *Computer's Random Numbers*.
- The secret Urn is Yellow and the Receiver's Guess is smaller than or equal to the largest of the two *Computer's Random Numbers*.

The Receiver earns 0 points otherwise.

This compensation rule was designed so that the Receiver has the greatest chance of earning 100 points when they choose a Guess that equals their true belief that the secret Urn is Red.

Final Payments

At the end of the experiment, the total number of points you earned will be converted to dollars at the rate of:

- \$0.012 per point (\$1.20 per 100 points) if you are the Sender.
- \$0.009 per point (\$0.90 per 100 points) if you are the Receiver.

In addition, you will receive a flat participation fee of \$10.

Practice Rounds:

The experiment will begin with 2 practice rounds, to make you familiar with the interface and the tasks of both Sender and Receiver. All the choices you make in the Practice Rounds are unpaid and do not affect in any way the rest of the experiment.

Summary

Before we start, let me remind you that:

- You will play 30 Rounds in the same role: Sender or Receiver. You will be assigned your role at the end of the Practice Rounds.
- The secret Urn has an equal chance of being Red or Yellow.
- The Computer randomly draws 10 balls from the secret Urn.
- The Sender can disclose to the Receiver up to 3 of these 10 balls.
- The Receiver has to guess how likely it is that the secret Urn is Red.
- The Receiver has the greatest chance of earning points when they choose a Guess that equals their true belief that the secret Urn is Red.
- The higher the Receiver's Guess, the greater the number of points earned by the Sender.
- At the end of each Round, you are randomly paired with a new participant.

2 Sample Selection and Data Collection Process

As mentioned above, the data were collected in the laboratory facilities of New York University and Columbia University through software designed using *oTree* (Chen et al., 2016). Subjects were recruited at New York University using *hroot* (Bock et al., 2014) and at Columbia using *ORSEE* (Greiner, 2015). No restrictions were imposed on the subject recruitment (other than participants being older than 18). Each participant was only allowed to take part in one session of the experiment.

All the data analyses in the paper have been performed, focusing attention on the last 15 rounds of the data (the second half of the data). The only figures including the whole dataset are Figures C.1, C.2, C.3, and C.4 in Online Appendix C (which aim to display learning patterns).

At the beginning of each session, subjects played two unpaid practice rounds in which they played the role of both sender and receiver. Those data are discarded at the beginning of the data analysis, and are never used in our results.

3 Variable Description

Below you can find the description of all the variables in the raw data that are used in the experiment (we exclude the variables automatically generated by *oTree*, which are not useful in the analysis). After we report the description of all the variables in the final dataset. The first part of the summary is also available on top of the do file `data_fflp_1.do`.

Raw data

- `participantid_in_session`: session-specific subject id
- `participantcode`: unique subject id
- `participantpayoff`: total earnings in \$ without showup fee
- `playerid_in_group`: variable = 1 if sender, = 2 if receiver
- `playerpayoff`: earnings in \$ in a round
- `playerearnings`: earnings in points in a round
- `playertotal_earnings`: total earnings in points; = 0 in all rounds except last

- playertype_p: type in practice rounds; = 0 if yellow, = 1 if red; empty in non-practice rounds
- playerfacts_X_p: number of type “X” balls in a practice round (type 1 = A, type 2 = B, type 3 = C, type 4 = D); = 0 in non-practice rounds
- playersent_X_p: number of type “X” balls in message in a practice round (type 1 = A, type 2 = B, type 3 = C, type 4 = D); = 0 in non-practice rounds
- playerempty_p: number of empty balls in message in a practice round; = 1 or 3 in non-practice rounds (depending on the value of k)
- playerguess_p: guess of receiver in practice round; empty in non-practice rounds
- playerdraw_X_p: for X=1 or X=2, two draws that determine payoff for the binarized scoring rule in the practice rounds; empty in non-practice rounds
- playertrial_earnings_s: points made by sender in practice; empty in non-practice rounds
- playertrial_earnings_r: points made by receiver in practice; empty in non-practice rounds
- groupid_in_subsession: session-specific round group (pair) identifier
- grouptype: type in non-practice rounds; = 0 if yellow, = 1 if red; empty in practice rounds
- groupfacts_X: number of type “X” balls in non-practice rounds (type 1 = A, type 2 = B, type 3 = C, type 4 = D); = 0 in practice rounds
- groupsent_X: number of type “X” balls in message in non-practice rounds (type 1 = A, type 2 = B, type 3 = C, type 4 = D); = 0 in practice rounds
- groupempty: number of empty balls in message in non-practice rounds; = 1 or 3 in practice rounds (depending on the value of k)
- groupguess: guess of receiver in non-practice rounds; empty in practice rounds
- groupdraw_X: for X=1 or X=2, two draws that determine payoff for the binarized scoring rule in the non-practice rounds; empty in practice rounds
- groupnet_round: actual round number (not counting practice); from 1 to 30; empty in practice rounds
- subsessionround_number: round number including practice rounds

- sessioncode: unique session identifier

Final dataset

After using the dat_fflp_1.do file, the list of variables is:

- id: unique subject identifier
- session: unique session identifier
- n: number of balls available. $n \in \{1, 3, 10, 50\}$
- k: maximum number of balls in a message. $k \in 1, 3$
- treatment: label of the treatment; 1: $n=1-k=1$; 2: $n=3-k=3$; 3: $n=10-k=1$; 4: $n=10-k=3$; 5: $n=50-k=1$; 6: $n=50-k=3$
- sender: 1 = role of sender, 0 = role of receiver
- group: session-specific group identifier
- red_urn: = 0 if urn is yellow, = 1 if urn is red
- available_x: number of available type “x” balls (type 1 = A, type 2 = B, type 3 = C, type 4 = D)
- sent_x: number of type “x” balls disclosed in the message (type 1 = A, type 2 = B, type 3 = C, type 4 = D)
- empty: number empty balls disclosed in the message
- guess: guess of the receiver
- round: paid round number
- prob.win: probability of winning prize in binarized scoring rule given the guess and urn
- bayes.equilibrium.posterior: probability that the urn is red given the theoretical equilibrium (the one predicted by the model) and the behavior of a Bayesian receiver (taking as given the disclosed message). Initially named in the data set as bayes_posterior
- naive_posterior_unc: probability that the urn is red if receivers ignore selection and treat empty messages as the “unconditional mean” message. Initially named as naive_posterior_a

- `naive_posterior`: probability that the urn is red if receivers ignore selection and ignore empty messages. Initially named as `naive_posterior_b`
- `message`: unique message identifier for each treatment (it identifies the message intended as a combination of signals)
- `best b`: indicator for equilibrium message (given the available balls)

The variables above are present in the dataset named `dat_fflp_1_compact.dta`

After using the `data.frame.ipynb` file, the additional variables added to the datasets are:

- `sent_message`: identifier for the message sent
- `freq_x`: frequency of type “x” balls disclosed in the message (type 1 = A, type 2 = B, type 3 = C, type 4 = D)
- `freq_empty`: frequency of the empty message
- `eq_sent_x`: number of type “x” balls disclosed in the equilibrium message (type 1 = A, type 2 = B, type 3 = C, type 4 = D). No empty messages are sent in equilibrium
- `eq_message`: identifier for the equilibrium message (given the available balls)
- `eq_freq_x`: frequency of type “x” balls disclosed in the equilibrium message (type 1 = A, type 2 = B, type 3 = C, type 4 = D)
- `naive_x`: number of type “x” balls disclosed by a receiver who randomizes among the available balls (type 1 = A, type 2 = B, type 3 = C, type 4 = D). No empty messages are sent by the naive type
- `naive_freq_x`: frequency of type “x” balls disclosed by a receiver who randomizes among the available balls (type 1 = A, type 2 = B, type 3 = C, type 4 = D). No empty messages are sent by the naive type

This complete set of variables is present in the dataset named `dat_fflp_1_compact_complete.dta`, which is then used for the data analysis.