Audi Alteram Partem

An Experiment on Selective Exposure to Information

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Motivation

- Ample evidence that people selectively search for information, in particular that they look for information consistent with worldview (Gunther 1992, Klayman 1995, Iyengar and Hahn 2009)
- Concern that selective exposure to like-minded sources contributes to partisan divide in news consumption (Gentzkow and Shapiro 2011, Quattrociocchi et al. 2016), drives segregation into echo chambers (Mann and Ornstein 2012, Flaxman et al. 2016)
- Even with standard preferences, listening to source likely to confirm beliefs can be rational for DM who can only listen to one source

This Paper

- We model optimal choice between two information sources:
  - DM holds prior over binary state of the world
  - DM rewarded for correctly guessing state
  - Before guessing, DM chooses a single source to receive signal from
  - Sources are biased towards different states, DM knows bias
- We test information acquisition and processing with experiment:
  - Known bias $\rightarrow$ no uncertainty on source reliability
  - Abstract setting $\rightarrow$ no prefs for consonant info/motivated beliefs
  - How does the normative model perform in the data?
- We manipulate prior beliefs on the state and relative reliability of sources $\rightarrow$ seeking confirmatory info optimal only in some treatments

The Decision-Making Task

- State of the world $\theta \in \{B, R\}$, unknown to DM
- DM asked to guess state, $a \in \{B, R\}$
- Payoff $u(a, \theta) = \begin{cases} \$1 \text{ if } a = \theta \\ \$0 \text{ if } a \neq \theta \end{cases}$
- Prior belief $\pi = Pr(\theta = B)$, $\pi > 1/2$
- Before guessing, DM chooses one information structure (or expert), $\sigma \in \{Blue, Red\}$, and observes the signal it generates, $s = \in \{b, r\}$

The Decision-Making Task

- DM knows conditional distribution of signals for each σ
- **Blue** is biased towards B and **Red** is biased towards R
- λ_σ captures magnitude of bias/probability of misleading signal:
  - With probability λ_σ, structure reports own color regardless of θ
  - With remainder probability, structure reports true θ
  - Thus, a smaller λ_σ implies a more reliable (or less biased) σ

(a) Blue Information Structure

	$s = b$	$s = r$
$\theta = B$	1	0
$\theta = R$	λ_B	$1 - \lambda_B$

(b) Red Information Structure

	$s = b$	$s = r$
$\theta = B$	$1 - \lambda_R$	λ_R
$\theta = R$	0	1

Theoretical Predictions

- Bayesian DM picks the most informative information structure

Lemma 1 (Optimal Guess when Signal from Blue)

The DM always follows the signal received from **Blue**.

- Intuition: confirmatory signal always reinforces the prior, while dis-confirming signal is fully revealing (and, thus, overturns the prior)

Lemma 2 (Optimal Guess when Signal from Red)

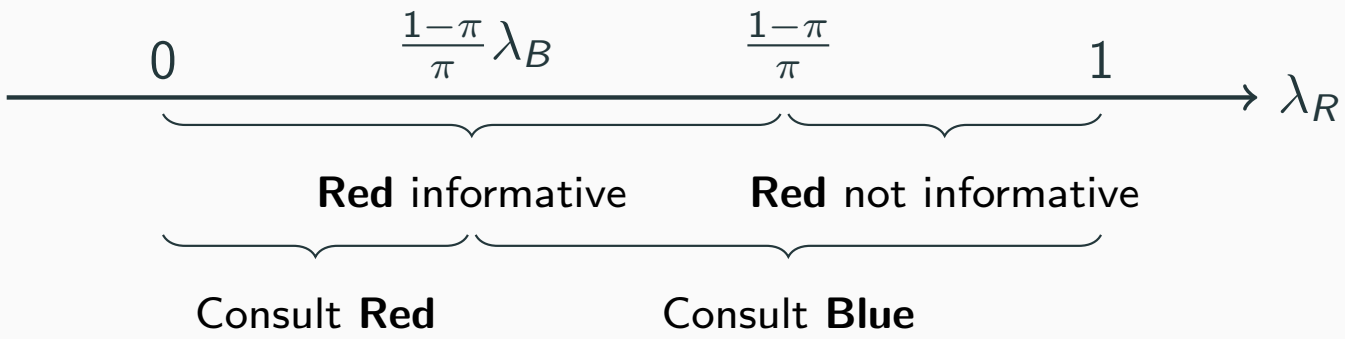
The DM always follows confirmatory signals received from **Red** but follows contradictory signals if and only if **Red** is sufficiently reliable.

- Intuition: confirmatory signal is fully revealing, while dis-confirming signal overturns the prior only if the source is sufficiently reliable

Theoretical Predictions

Proposition 1 (Optimal Information Structure)

The DM consults **Red** if and only if $\lambda_R < \frac{1-\pi}{\pi}\lambda_B$, and **Blue** otherwise.



Summary of Testable Hypotheses

Two hypotheses about **information acquisition**:

- **H1**: Information structures are equally reliable $\Rightarrow$ optimal to listen to source biased towards prior (i.e., Blue) for any prior
- **H2**: Source biased against the prior (i.e., Red) is more reliable $\Rightarrow$ optimal to listen to Red if and only if the prior is mildly unbalanced

Two hypotheses about **information processing**

- **H3**: Always follow information from source biased towards prior
- **H4**: Always follow confirmatory information from source biased against prior; follow contradictory information from source biased against prior if and only if the prior is mildly unbalanced

Experimental Design

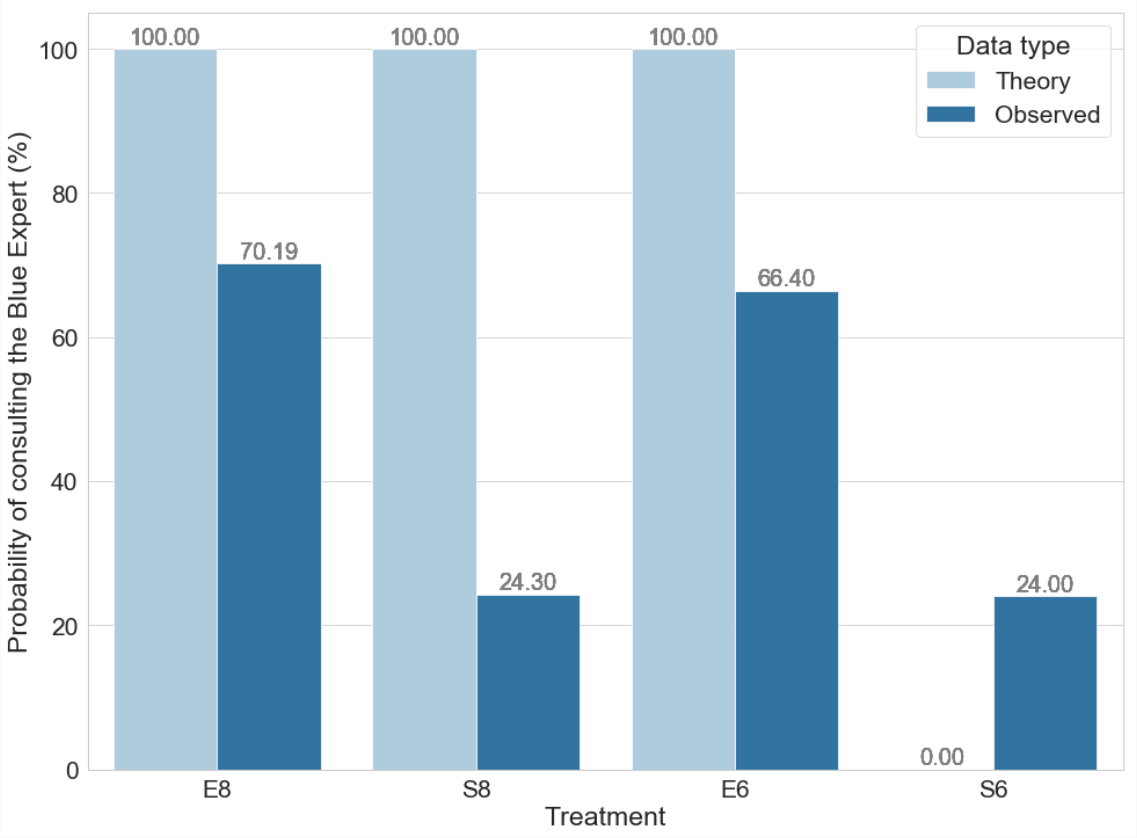
- Experiment conducted on Prolific with 201 US citizens and residents
- Two experimental manipulations (between-subjects):
  1) prior belief on state of the world, $\pi = 0.6$ or $\pi = 0.8$
  2) relative reliability, $(\lambda_R, \lambda_B) = (0.5, 0.5)$ or $(\lambda_R, \lambda_B) = (0.3, 0.7)$
- Four treatments:
  - **E6**: Equally reliable experts, prior mildly favors blue state
  - **E8**: Equally reliable experts, prior strongly favors blue state
  - **S6**: Red more reliable, prior mildly favors blue state
  - **S8**: Red more reliable, prior strongly favors blue state
- Optimal to consult Red only in treatment S6

Experimental Design

- Subject asked to guess color of a ball randomly drawn from an urn:
  - Urn has 10 balls and fraction π is blue
- Before guessing the color, subject chooses what expert to consult
- Before seeing the expert's report, subject is asked:
  - guess on state conditional on report (strategy method, incentivized)
  - confidence in guess (not incentivized)
- Each participant makes 5 decisions (IID draws of state, signal)
- We reward correct guess in one random round

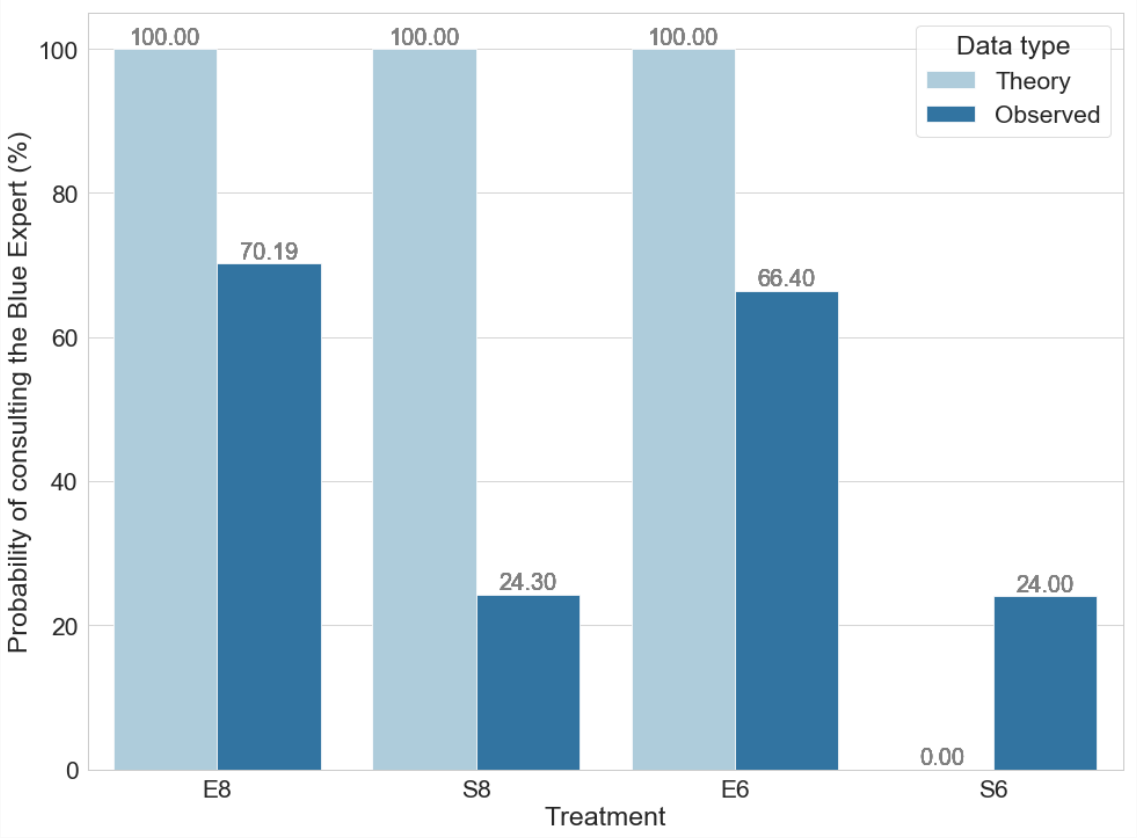
Results: Information Acquisition

- **Finding 1**. When information sources are equally reliable, subjects are more likely to acquire information from the source biased towards the prior, which is optimal.



Results: Information Acquisition

- **Finding 2**.When the source biased against the prior is more reliable, subjects are more likely to acquire information from the more reliable source, regardless of the prior and whether this is optimal or not.



Results: Information Acquisition

- **Finding 3**. In all treatments, subjects frequently acquire information from the less informative source and this leads to sub-optimal learning; this is worsened by sub-optimal use of information.

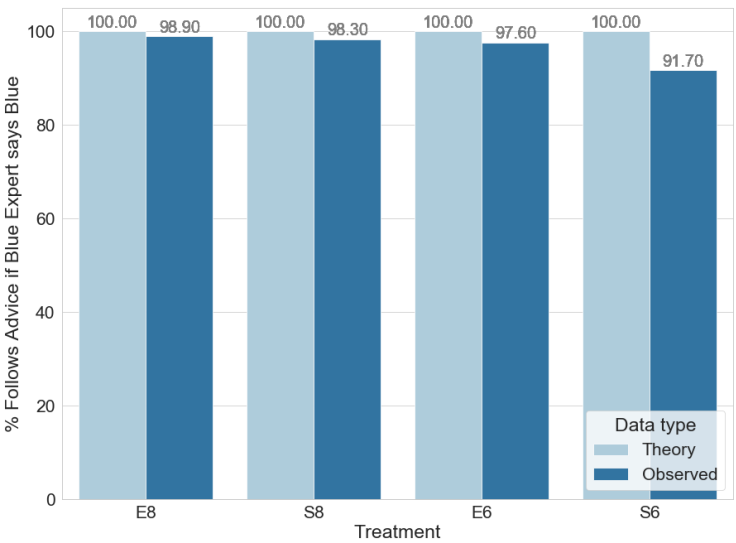
Treatment	N	Observed	Observed Source & Bayesian Updating	Optimal Source & Bayesian Updating
E8	265	+1.1	+7.2	+8.7
S8	235	-3.4	+1.7	+7.7
E6	255	+6.6	+9.4	+16.8
S6	250	+14.8	+27.2	+28.4

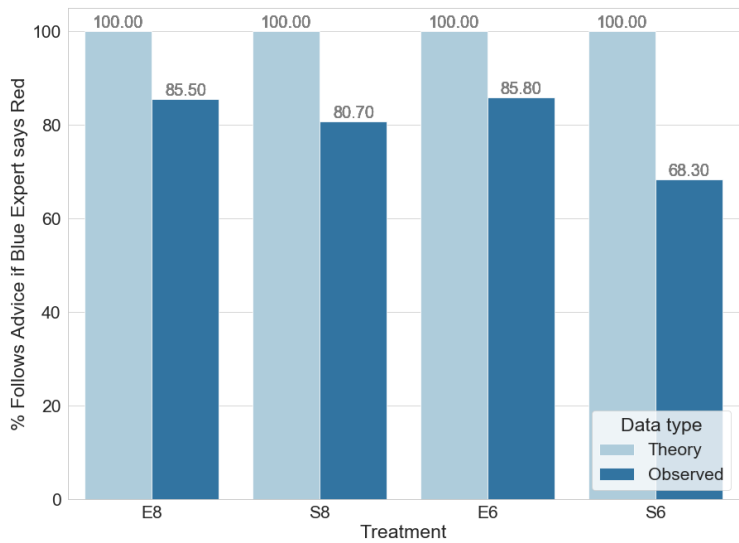
Table 2: Guessing Accuracy Improvement over Prior by Treatment

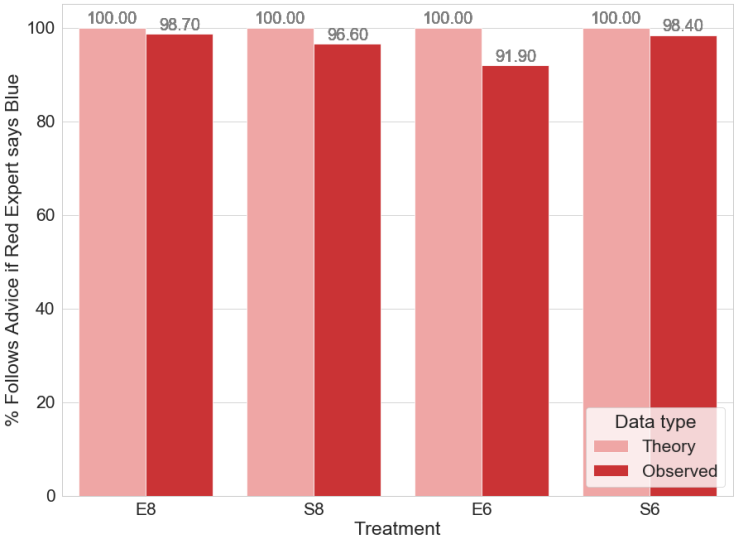
Results: Information Processing

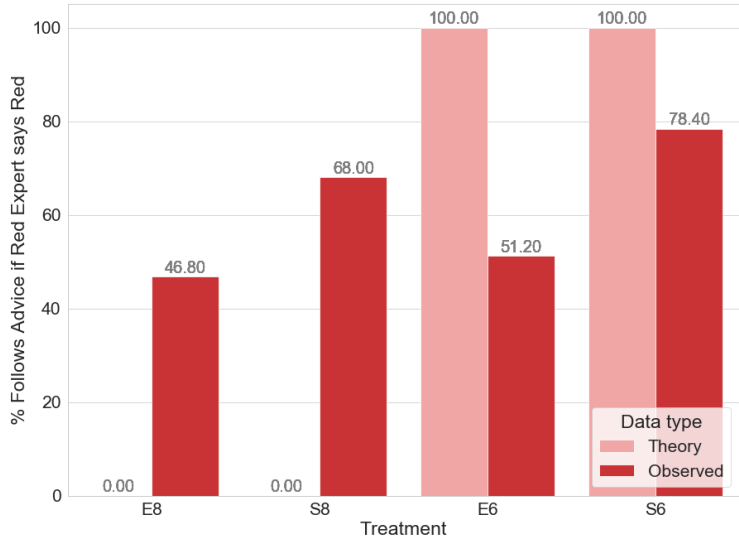
- Let's call confirmatory advice a signal aligned with prior
- Similarly, call contradictory advice a signal in contrast with prior
- **Finding 4**. Participants follow confirmatory advice optimally.
- **Finding 5**. Participants follow contradictory advice sub-optimally
  - Too skeptic with structure biased towards prior
  - Too trusting with structure biased against prior

Results: Information Processing









Results: Information Processing

- Define responsiveness to information as

$$\alpha_s = \frac{p_s - p_0}{p_s^{Bay} - p_0}$$

  - where p_0 is prior, p_s is observed posterior (from non-incentivized confidence statements), and p_s^{Bay} is Bayesian posterior

- **Finding 6**. Subjects are insufficiently responsive to information misaligned with a source bias (e.g., r from Blue) and excessively responsive to information aligned with a source bias

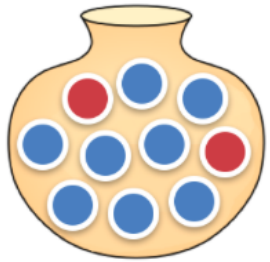
Conclusion

- We model of selective exposure to information by Bayesian decision makers, identify when it is rational to seek (dis)confirmatory information and test these predictions with an online experiment
- We found Bayesian inference has limited explanatory power
  - Confirmatory patterns when sources equally reliable (as predicted)
  - Disconfirmatory patterns regardless of initial information when source biased against the prior is more reliable (contrary to theory)
  - We document partial insensitivity to prior (*base-rate neglect*)
- Simple heuristics (e.g. listen to more reliable/less biased source) appear to be important drivers of information acquisition

Sample Screenshots

PRACTICE ROUND - WHOSE ADVICE DO YOU WANT?

There is a jar containing 8 **BLUE** balls and 2 **RED** balls.



The computer has randomly drawn **ONE** ball out of this jar.

Your task is to assess the likelihood that the ball drawn by the computer is BLUE.

Before you make your assessment, you can get advice from a **BLUE** or a **RED** expert.

If you get advice from a **BLUE** expert:

- If the ball is BLUE:
  - An informed BLUE expert says “The ball is BLUE”
  - An uninformed BLUE expert says “The ball is BLUE”
- If the ball is RED:
  - An informed BLUE expert says “The ball is RED”
  - An uninformed BLUE expert says “The ball is BLUE”

Sample Screenshots

If you get advice from a **RED** expert:

- If the ball is BLUE:
  - An informed RED expert says "The ball is BLUE"
  - An uninformed RED expert says "The ball is RED"
- If the ball is RED:
  - An informed RED expert says "The ball is RED"
  - An uninformed RED expert says "The ball is RED"

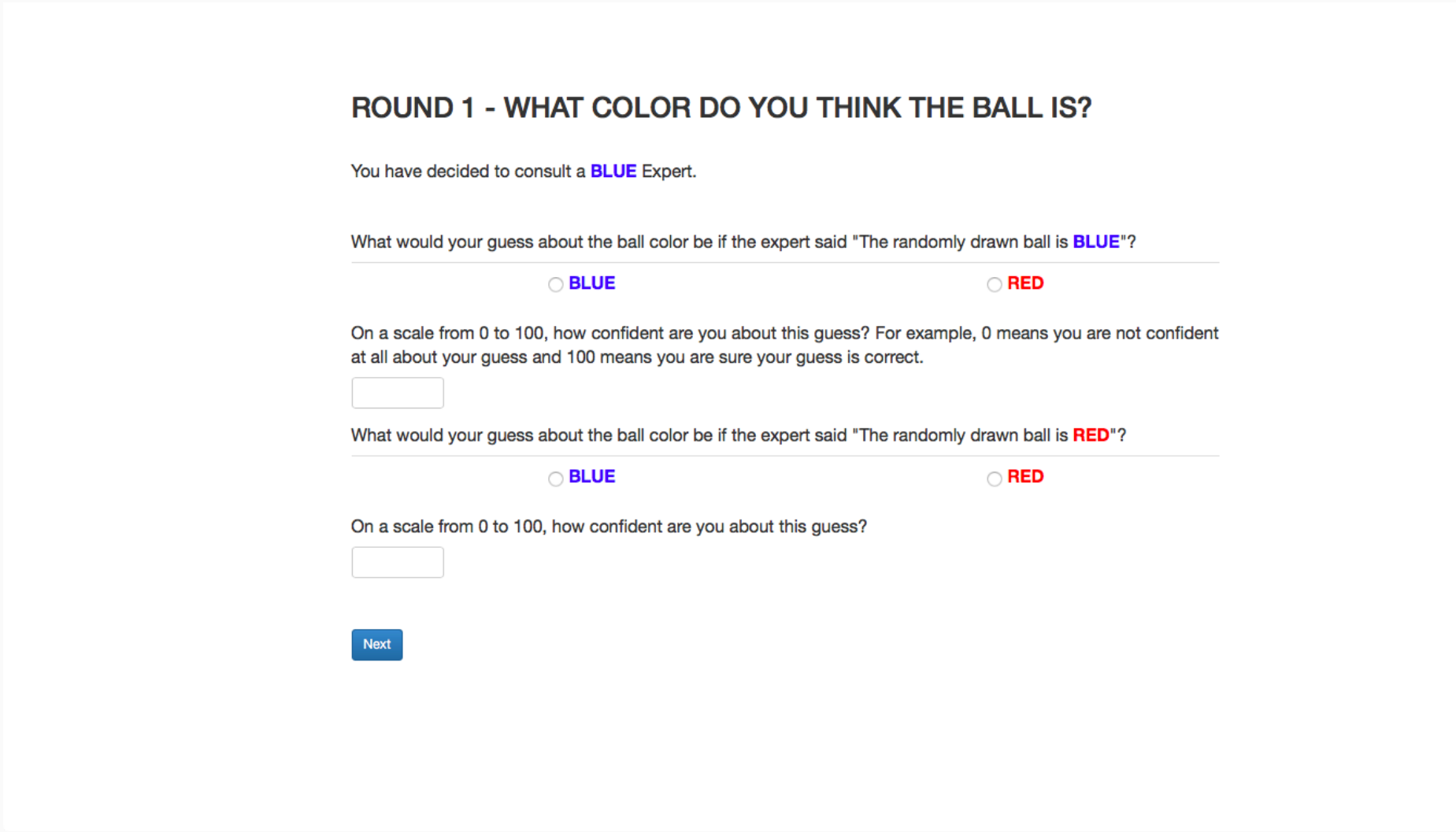
Remember that 5 out of 10 BLUE experts are informed and 5 out of 10 RED experts are informed.

Which expert do you want to hear from?

○ **BLUE** Expert ○ **RED** Expert

Next

Sample Screenshots



Sample Screenshots