The Nature of Experience Project*
– Results according to Study Plan –

Florian Diekert[1,2], Timo Goeschl[1], and Christian König-Kersting[1]

[1]Alfred Weber Institute for Economics, Heidelberg University
[2]CEES, Department of Biosciences, University of Oslo

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The original document presents the research design for the Nature of Experience Project. This description should serve to help readers understand the context and the motivation for specific design choices, the hypotheses to be tested, as well as the planned implementation of the experiment, while maintaining flexibility with regards to the publication strategy of the eventual findings. The updated plan contains the results on the tests of the original hypotheses and the description of an additional treatment with corresponding hypotheses. The test results according to the updated plan from October 10, 2019 are typeset in purple, and the hypothesis relating to an additional treatment conducted in the spring of 2022 are typeset in teal.

Research question

Both strategic and natural uncertainty (risk) determine whether agents receive an economic reward in many environments. Moreover, many environments require repeated decisions. When periods are stochastically independent, do agents respond to an adverse outcome? And does it matter for their response whether the strategic or the natural uncertainty materialized to cause the event?

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Experimental design

The experiment is designed to cleanly disentangle strategic uncertainty from natural uncertainty.[1] We match participants with a co-player to play a game of chicken (normal-form matrix is shown in Figure 1). The eventual payoff of the players depends on their play in the game and on the draw of a lottery. That is, when a "red ball" is drawn in the lottery, or when both players choose "action B" in the chicken game, they receive a payoff of zero. When a participant chooses "action A" in the chicken game, and a "green ball" is drawn in the lottery, she receives a payoff of x and when a participant chooses "action B" in the chicken game, while her co-player chooses "A", and a "green ball" is drawn in the lottery, she receives a payoff of $x + y$.

		Player 2	
		A	B
Player 1	A	x , x	x , $x+y$
	B	$x+y$, x	0 , 0

Figure 1: Normal form of the chicken game

We play two rounds of this game and randomly rematch players (perfect stranger matching). After the first round, full information about the outcome of the lottery and the choice of the matched co-player is provided. Participants receiving a payoff of zero will therefore know exactly whether their payoff can be attributed to the unfortunate realization of the natural uncertainty, or the strategic uncertainty, or both. In round two, participants are tasked to again choose between A and B.[2]

Because natural and strategic uncertainty are independent, there are eight different histories in the first round of the experiment that we present in Table 1. We introduce the following notation: The realization of the lottery is denoted by $L_t = \{\text{red}; \text{green}\}$. The choice of player i in round t is denoted by $C_{i,t} = \{\text{A}; \text{B}\}$ (parallel for player j). The payoff of player i for round t is denoted by $\pi_{i,t}$. For easier reference, we number the eight different histories in the first round H=h1,...,h8. The last column of Table 1

[1] In economics, the terms "risk" and "uncertainty" are often used to mean two different situations. Risk then refers to a situation where the probability with which an event out of a set of potential outcomes occurs is known, and (Knightian) uncertainty refers to a situation where the probabilities with which an event out of a set of potential outcomes occurs is not known. Here, we do not attempt to strictly differentiate between these two terms. We use the broader and more common term of uncertainty, also to acknowledge that participants may be perceive the situation as uncertain, even though we explicitly tell the participants the probabilities with which the events are to occur.

[2] Only one of the two rounds will be randomly selected for payout so that there are no income effects that carry over from the first to the second round of the game.

gives the probability that a given history occurs, where we denote the probability that a red ball is drawn in the lottery by p (that is, $p = \Pr(L = \text{red})$) and the probability that participant chooses “action B” by q. This means, for example, that the history h1, according to which a green ball is drawn from the urn and both players choose “A”, occurs with probability $(1-p)(1-q)^2$.

Table 1: The eight different histories in the first round

H	L	$C_{i,1}$	$C_{j,1}$	$\pi_{i,1}$	$\Pr(H{=}\text{h}n)$
h1	green	A	A	x	$(1-p)(1-q)^2$
h2	green	A	B	x	$(1-p)(1-q)q$
h3	green	B	A	$x+y$	$(1-p)q(1-q)$
h4	green	B	B	0	$(1-p)q^2$
h5	red	A	A	0	$p(1-q)^2$
h6	red	A	B	0	$p(1-q)q$
h7	red	B	A	0	$pq(1-q)$
h8	red	B	B	0	pq^2

Observing the behavior of experimental subjects in both rounds allows us to investigate whether the experience of a zero-payoff outcome in the first choice situation affects participant’s behavior in a second choice situation. Furthermore, comparing the behavior in the second choice situation after a zero-payoff event has been uniquely caused by the actions in the chicken game (strategic uncertainty) or by the lottery draw (natural uncertainty) allows us to determine whether the source of the zero-payoff matters.

The fundamental challenge to identify whether the reason for the zero-payoff event matters for changing the choice in the second situation is that only those participants that choose “action B” in the first round are in a position to experience both natural or strategic uncertainty. For those participants that choose “action A” in the first situation, only natural uncertainty can be the cause of the zero payoff event. Obviously, this could lead to a significant selection bias.

To overcome this, we conduct two treatments. First, the “real action” treatment (**RA**), where participants take a real choice in both rounds, and second, the “assigned action” treatment (**AA**), where we assign the first round choice B to the participants. The participants’ payoff in the first round of the “assigned action” treatment is determined by matching their action with a first round choice from the “real action” treatment. In the second round, participants in the AA-treatment take a real choice as well. Before presenting the first round to these participants, we elicit their preferred action (this is not done in the RA-treatment, obviously). We can test whether the first round in the AA-treatment was indeed successful in inducing "experience" in spite of the external assignment of action by comparing the second round behavior between the treatments conditional on the expressed preference for the first round action.

Another concern for identification could be that players may react to differences in the perceived likelihood of a zero-payoff event stemming from the two sources of uncertainty. As can be seen from Table 1, for a given q, we can calibrate p to obtain different distributions of our sample over histories (at least in terms of ex-ante likelihood). We aim for a distribution where it is equally likely that the zero payoff event is uniquely caused by both player's choosing "B" or by the ball being "red", which requires[3] $p = q^2$.

Of course, q is unknown as it depends on the behavior of the participants (this may, in fact, depend on p, even though the two probabilities are independent). To this end, we have conducted three pilots with different values of p and observed the resulting q in the first decision that participants took. Specifically, we observed a value of q=0.36 in the pilot with p=0.4 (N=81), a value of q=0.38 in the pilot with p=0.2 (N=107), and a value of q=0.47 in the pilot with p=0.1 (N=92). Although we do see that the point estimate of q decreases with p, these values are statistically indistinguishable. Given the data from the pilot, we set p=0.2.

To provide sufficient incentives, we set the payoffs to x=1 USD and y=2 USD, which is comparatively high for short surveys that are offered in online labor markets.

Implementation

The experiment is conducted online with participants being recruited from the Amazon Mechanical Turk platform. We use o-Tree (Chen et al., 2016) to program the experiment. The full instructions are provided in the Appendix. Figure 2 illustrates the flow of the experiment.

After the introduction where participants give consent to participate, we present the rules of the game. We also announce, based on past experience with the pilots, the likelihood of the co-player playing A or B. The participants then have to complete seven comprehension questions. In the "assigned action" treatment, we ask participants for their preferred choice of action, followed by a screen that announces their assigned action (B in all cases). In the "real action" treatment, participants are simply asked for their real choice. After the choice, participants are asked about their belief about the probability that the ball drawn was red or that their co-player chose action B. Finally,

[3] $\Pr(H = \text{h4}) = \Pr(H \in \{\text{h5,h6,h7}\}) \Rightarrow (1-p)q^2 = p(1-q)^2 + 2pq(1-q) \Leftrightarrow p = q^2$.

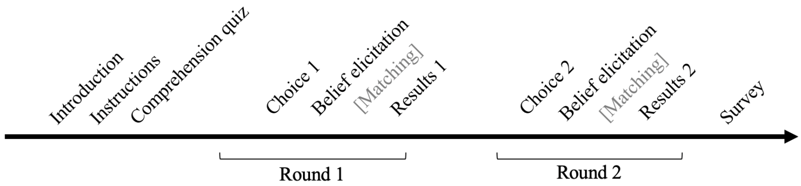

Figure 2: Stages of the experiment

we match participants with co-players' choices and calculate the resulting earnings. In the AA treatment, the respective co-player's choice is a random draw (with replacement) from the observed first-round choices from the first session of the RA treatment (N=300).

The second round in the RA treatment is identical to the first round. In the AA treatment, participants now have real choice, so that the second round in the AA treatment is identical to the second round of the RA treatment. After making a choice in round 2, we ask participants about the reason why they have (or have not) changed their choice between round 1 and round 2. After seeing the results from the second game, participants take a short survey, completing the experiment. In the survey, we ask about age, gender, educational level, and a generic assessment about their willingness to take risks.

A first set of sessions took place on March 11-13, 2019, from which we have in total 1982 observations. The mean age in this sample is 37 years and 48% of the participants are female. We have 986 participants in the "real action" (RA) treatment and 996 participants in the "assigned action" (AA) treatment. There are no differences in age or gender composition between the treatments.

A second set of sessions took place between October 31, 2019 to November 4, 2019, from which we have in total 2010 observations. The mean age in this sample is 37 years and 51% of the participants are female. We have 1025 participants in the "real action-computer co-player" (RA-CC) treatment and 985 participants in the "assigned action-computer co-player" (AA-CC) treatment. There are no differences in age or gender composition between the treatments.

Hypotheses and testing

In this section, we describe our specific hypotheses and how we aim to test them. We have three overarching research questions: First, does the experience of a zero payoff outcome in the first round affect choice in the second round? Second, does it make a difference whether the zero payoff outcome was attributable to strategic or natural uncertainty, that is, does the nature of experience matter? Third, which participant characteristics can explain their choice and the potential reaction to a zero payoff outcome?

Before we turn to how we operationalize these three questions and test the corresponding hypotheses, it us useful to define an indicator of change in choice in the following way: Let Y_i=0 if $C_{i,1}$=$C_{i,2}$ and Y_i=1 if the action chosen in the second round is the opposite of the action implemented in the first round ($C_{i,1} \neq C_{i,2}$).

In addition, we recall the variable definitions used in Table 1: The set of histories h1 to h8 is denoted by H and the outcome of the lottery is denoted by L_t. The treatment condition T is either RA for "real action" or AA for "assigned action".

1 The effect of experience

Provided that all participants are fully rational players and believe that all other participants are also fully rational, standard game theory gives a clear prediction about the outcome of the experiment. The strategic choice situation of the participants has the form of a chicken game. The chicken game has a Nash equilibrium in mixed strategies ($q^* = \frac{2}{3}$). Subjects are informed about previous average play in this game form and given the same parametrization. Subjects are also informed about the probability of a bad draw in the lottery. Moreover, the probability is independent of the strategic choice and partner reassignment between rounds is randomized. Both the information about average play and about the lottery remain the same in the first and the second round. In such a setting, standard game theory predicts that no change in **average** behavior should be observed.

If deviations from fully rational play or from the belief in other players' fully rational play are taken into account, then alternative predictions about average behavior arise. Deviations from fully rational play could come from any one of several different behavioral effects:.

- *Regret* Participants that have experienced a zero-payoff event may want to minimize the chance of experiencing it again and chose action A in the second round, in particular those that have caused the event to occur by choosing B in the first round.

- *Recency effect* Participants could update their beliefs about the lottery or about the co-player's action in the direction of the most recent observation, even though the probabilities have not changed statistically.

- *Variety effect* Participants could value variety of choice for its own sake.
- *Experimentation effect* Participants could believe that they learn something about the game by changing play.

This characterization of alternative behaviors is neither exhaustive nor complete. Likewise, the beliefs in the population about the presence of rational or alternative behavioral types are unknown. The agnostic prediction is therefore captured in hypothesis 1.

Hypothesis 1 *Experience does not affect behavior.*

Because the probability to experience the zero-payoff event is strictly decreasing in the probability to choose action A, a direct but naïve way of testing hypothesis 1 would be to compare the propensity to choose action A in the second round between those participants that have experienced a zero-payoff event in the first round and those that have not. Such a test could lead to a false positive, however. For example, the average proportion of participants that choose $C_{i,1}{=}A$ conditional on not observing a zero-payoff outcome is higher than the average proportion of participants that choose $C_{i,1}{=}A$ conditional on observing a zero-payoff outcome, even if no participant reacts to the experience of the zero-payoff event. Rather, one must investigate the change in choice to test whether experience affects behavior. In other words, we test hypothesis 1 using a binomial test, where we expect:

$$\text{(1)} \qquad \mathrm{E}[Y|H{=}\mathrm{h3} \wedge T{=}RA] = \mathrm{E}[Y|H{\in}\{\mathrm{h4,h7,h8}\} \wedge T{=}RA]$$

$$\text{(2)} \qquad \mathrm{E}[Y|H{=}\mathrm{h3} \wedge T{=}AA] = \mathrm{E}[Y|H{\in}\{\mathrm{h4,h7,h8}\} \wedge T{=}AA]$$

Note that by conditioning on history h3, h4, h7, or h8, we consider only those participants with action B in the first round (see Table 1). As a consequence, a value of $Y_i{=}1$ uniquely means $C_{i,2}{=}A$.

As indicated above, we conduct this test for each treatment separately. The prime group of interest are those participants that were all assigned action B in the first round (AA treatment). For the RA treatment, only those participants that preferred action B were in a position to experience a zero-payoff event due to both strategic or natural uncertainty. As participants that choose $C_{i,1}{=}B$ may differ, also along unobservable dimensions, from participants that choose $C_{i,1}{=}A$, there may be a selection effect in in the RA treatment. An indication for such a selection effect could be a difference in the *relative* propensity to change choices in the different treatments.[4]

[4]Surely, we expect a higher absolute value of the average propensity to change choices in treatment AA as a part of the participants were assigned an action that they did not prefer.

We cannot reject hypothesis 1 for either treatment: E$[Y|H{=}\text{h3} \wedge T{=}RA]$ = 0.23 and E$[Y|H{\in}\{\text{h4,h7,h8}\} \wedge T{=}RA]$ = 0.31 (p=0.11, two-sided test of proportion). Similarly, E$[Y|H{=}\text{h3}\wedge T{=}AA]$ = 0.57 and E$[Y|H{\in}\{\text{h4,h7,h8}\}\wedge T{=}AA]$ = 0.61 (p=0.22, two-sided test of proportion). For the computer co-player treatments, hypothesis 1 can be rejected for the RA-CC treatment, but not for the AA-CC treatment. E$[Y|H{=}\text{h3} \wedge T{=}RA - CC]$ = 0.30 and E$[Y|H{\in}\{\text{h4,h7,h8}\} \wedge T{=}RA - CC]$ = 0.21 (p=0.03, two-sided test of proportion). Similarly, E$[Y|H{=}\text{h3}\wedge T{=}AA]$ = 0.51 and E$[Y|H{\in}\{\text{h4,h7,h8}\}\wedge T{=}AA]$ = 0.47 (p=0.33, two-sided test of proportion).

2 The nature of experience

Turning to the question whether it makes a difference if the zero payoff outcome is attributable to strategic or natural uncertainty, we simply compare the average change in choice after experiencing history h4, according to which the strategic situation uniquely caused the zero-payoff event, with the average change in choice after experiencing history h7, according to which the draw from the urn uniquely caused the zero-payoff event. Again, we formulate an agnostic hypothesis that we test for each treatment separately.

Hypothesis 2 *The differential nature of experience does not affect behavior.*

$$\text{E}[Y|H{=}\text{h4} \wedge T{=}RA] = \text{E}[Y|H{=}\text{h7} \wedge T{=}RA] \tag{3}$$
$$\text{E}[Y|H{=}\text{h4} \wedge T{=}AA] = \text{E}[Y|H{=}\text{h7} \wedge T{=}AA] \tag{4}$$

For the RA treatment, we find E$[Y|H{=}\text{h4} \wedge T{=}RA]$ = 0.37 and E$[Y|H{=}\text{h7} \wedge T{=}RA] = 0.19$. The difference is significant ($p = 0.02$, two-sided test of proportion). For the AA treatment we find E$[Y|H{=}\text{h4}\wedge T{=}AA] = 0.63$ and E$[Y|H{=}\text{h7}\wedge T{=}AA] = 0.52$ ($p = 0.09$, two-sided test of proportion). Note that a large part of participants in this sample were assigned an action that they did not prefer. Denoting that subsample of participants that prefer action B by AAp and that subsample that did not prefer B by $AAnp$, we find E$[Y|H{=}\text{h4}\wedge T{=}AAnp] = 0.80$ and E$[Y|H{=}\text{h7}\wedge T{=}AAnp] = 0.80$ ($p = 1$, two-sided test of proportion). For those that prefer action B, we find E$[Y|H{=}\text{h4}\wedge T{=}AAp] = 0.33$ and E$[Y|H{=}\text{h7} \wedge T{=}AAp] = 0.08$ ($p = 0.003$, two-sided test of proportion). For the RA-CC treatment, we find E$[Y|H{=}\text{h4} \wedge T{=}RA - CC] = 0.20$ and E$[Y|H{=}\text{h7} \wedge T{=}RA] = 0.20$ ($p > 0.99$, two-sided test of proportion). For those that prefer action B in the AA-CC treatment, we find E$[Y|H{=}\text{h4}\wedge T{=}AAp - CC] = 0.23$ and E$[Y|H{=}\text{h7}\wedge T{=}AAp] = 0.13$ ($p = 0.16$, two-sided test of proportion).

3 Participants' characteristics

Individual characteristics may play an important role. We will control for participants' characteristics such as age, gender, level of education, as well as their beliefs about the co-player's action and their general propensity to take risks in a multivariate analysis.

We explore these effects by regressing the first period choice (C_1; the chosen action in the RA treatment and the preferred action in the AA treatment) and the indicator of a change in choice (Y) on the explanatory variables. As the dependent variables are binary, logit regression models are suitable.

There is ample of evidence for women being more risk averse than men (Eckel and Grossman, 2008; Croson and Gneezy, 2009). Similarly, age has been found to affect behavior in these types of games, yet in a weaker fashion (Harbaugh et al., 2002). The educational level in turn is unlikely to have strong behavioral effects, but it may explain why participants do not switch actions, as more educated participants (and in particular those with a degree in math and sciences) are more likely to understand the independent nature of the two types of uncertainty.

With respect to the self-reported level of risk aversion, the clear hypothesis is that the higher the risk aversion, the more likely it is that a participants prefers action A. Similarly, we expect that the stronger the belief that the other player chose action B, the more likely it is that a participants prefers action A.

Finally, we explore whether the reasons that participants give at the survey to justify the choice they have made in the second period can shed a light on the mechanisms that may be at play for explaining the observed outcomes.

4 Computer co-player treatment

We observe that more players change their choice when the zero payoff outcome was uniquely caused by the choice of the players than when it was uniquely caused by the urn draw. To assess whether this result is driven by the fact that the co-player was a human, while the urn draw was determined by a computer program, we administer additional computer co-player treatments ($RA\!-\!CC$ and $AAp\!-\!CC$, respectively)[5]. Here, the co-player is not another human participant but a computer that is programmed to select action A in 60 out of 100 cases and action B in 40 out of 100 cases.

To formalize this test, let Δ_T be the difference between the number of participant in treatment T that change their choice when the zero payoff outcome was uniquely caused

[5] Where we expect to see an effect only for the subsample of participants that actually preferred action B, denoted by AAp.

by the choice of the players and the number of participant that change their choice when the outcome was uniquely caused by the urn draw. That is: $\Delta_{\mathrm{RA}} = \mathrm{E}[Y|H{=}\mathrm{h4} \wedge T{=}RA] - \mathrm{E}[Y|H{=}\mathrm{h7} \wedge T{=}RA]$. When the result that the nature of experience affects behavior is driven by the fact that the co-player was a human, we expect that this difference is larger in the original RA treatment then in the CC treatment:

Hypothesis 3 *Human factor.*

$$\Delta_{RA} > \Delta_{RA-CC} \tag{5}$$
$$\Delta_{AAp} > \Delta_{AAp-CC} \tag{6}$$

We find:

$$\Delta_{RA} = 0.178 > 0.004 = \Delta_{RA-CC} \tag{7}$$
$$\Delta_{AAp} = 0.101 > 0.096 = \Delta_{AAp-CC} \tag{8}$$

5 Passive participant treatment

The computer co-player treatment replaced the social risk that is contained in the strategic component of the MCG with another natural risk: Whether the co-player's action is A or B is determined by a computer program. Thus, the CC treatment allows us to rule out that the behavioral difference that we observe in the RA treatment with respect to hypothesis 2 is due to the fact that the social risk and the natural risk emerge at different places and in different framings (strategic versus non-strategic, choice versus urn draw).

Clearly, the computer co-player cannot "receive" any payment from the experiment. Consequently, the CC treatment cannot inform us on the role that other-regarding preferences play with respect to the observed reaction to the experience of social risk. To shed some light on this question, we conduct an additional treatment with a passive participant (PP). In the PP-treatment, the risk in the strategic component of the MCG is again determined by a computer, but the payoff is received by another, passive, participant. Thus, while the experience of risk is caused by a computer in the PP treatment as in the CC treatment, the consequence of the risk is borne by a human as in the RA treatment.

Motives and preferences are diverse, but if active participants react to the experience of social risk mainly because they are concerned about the consequences that their actions have on the payouts of others, we should observe a difference in the change of choice in the PP treatment that is maybe less than but similar to the one in the RA treatment. If active participants react to the experience of social risk mainly because they are concerned about the consequences that another human has on their own payoff, then we should expect, on average, no difference in the change in choice when an adverse event is due to an unfortunate urn draw or the co-player. These two motivations are, of course, neither exhaustive nor mutually exclusive.

Building on the previous treatments, we formulate two directed hypotheses. First, we expect that some active participants react to the experience of an adverse event if the consequences of their actions are borne by another human. Second, because the adverse event itself was caused by a computer either way (by an urn draw or by a selected action), we expect that the reaction is weaker than the reaction we have observed in the RA treatment.

Hypothesis 4 *The differential nature of experience affects behavior when there is a passive participant.*

$$\mathrm{E}[Y|H{=}\mathrm{h4} \wedge T{=}PP] \; > \; \mathrm{E}[Y|H{=}\mathrm{h7} \wedge T{=}PP] \tag{9}$$

Hypothesis 5 *The effect of the differential nature of experience is stronger when there is an active participant rather than a passive participant.*

$$\Delta_{RA} > \Delta_{PP} \tag{10}$$

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Appendix – Instructions

Instructions

Legend: [page references], [treatment differences], [user interface elements], [check elements]

[mTurk title]
Research in Decision Making

[mTurk description]
Participate in a game and a short survey. Please note that the task is to be completed within 10-15 minutes as you are matched with a co-player.

[mTurk preview, on separate screen]

Please read this carefully before clicking 'accept'.
This HIT is an academic research study on decision making.

Research goal:
In this study, we are interested in decision making under uncertainty. You will be matched with co-players and you will be asked to take a decision.

Duration and reward:
The entire study will take about 10 minutes. Your payment consists of a fixed reward of $0.50 via Amazon Mechanical Turk for successful completion and a bonus that depends on your and the co-players' decisions as well as on chance. You are also asked to complete a short and anonymous survey.

Please note that the task should be completed without delay.

Confidentiality:
All data we collect is treated confidentially and will only be used for our research purpose. Your name will not be linked to the results in any way.

Requirements:
To participate, you need to be located in the United States of America. You may not have participated in this study before. There are no other formal requirements for participation.

Voluntary participation:
Participation in this study is voluntary. If you do not want to take part in the study, please do not accept the HIT. If you want to participate, please be sure you can commit to completing the HIT before accepting it - if you discontinue participation, you will not receive any bonus.

Contact:
If you have any questions regarding this study, please contact Florian Diekert natcoop@awi.uni-heidelberg.de.

[accept HIT]

1

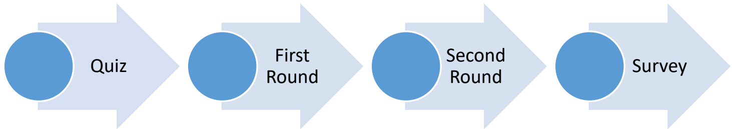
[Introduction]

Introduction
Thank you for participating.

If you read these rules carefully and choose wisely, you can earn up to US$ 3.50 by participating in a game that involves other participants.

Completing this task will take about 7 minutes and it is important that you pay close attention during this time so that you do not spoil the task for you and the other participants.

After we have explained the game, there comes the task. The task has four stages.



First, you take a small **quiz** about the game.

Then you are matched with another participant and the **first round** of the game is played.

Thereafter, you are matched with a different participant and the **second round** of the game is played.

Finally, you are asked to fill out a short **survey**.

Note that only one of the two rounds will be selected for payment at random. As it is unknown which of the two rounds counts, it is important to pay equally close attention to both.

[next]

[Instructions 1]

Rules

You will be a player in a game. Here are the rules.

There is the player, a co-player, and a virtual urn that contains 100 balls, some red, some green.

For each player, three factors together determine the payoff:

(1) The draw of a ball from the urn,
(2) The player's own action, and
(3) their co-player's action.

The player and the co-player take one of two actions, either **A** or **B**. The urn from which the ball is drawn contains 20 **red** balls and 80 **green** balls. Both player and co-player learn the color of the draw and the other player's action at the end of the round.

If a **red** ball is drawn, the actions of the player and the co-player do not matter for the outcome. The player receives nothing (US$ 0). So does the co-player (US$ 0).

If a **green** ball is drawn, then the actions of the player and the co-player matter for the outcome. There are four possibilities:

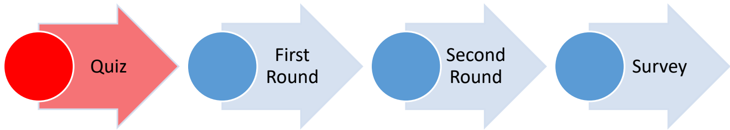
- A **green** ball is drawn and the player's **action is A** and the **co-player's action is A**: The player receives US$ 1. So does the co-player (US$ 1).
- A **green** ball is drawn and the player's **action is A** and the **co-player's action is B**: The player receives US$ 1. The co-player receives US$ 3.
- A **green** ball is drawn and the player's **action is B** and the **co-player's action is A**: The player receives US$ 3. The co-player receives US$ 1.
- A **green** ball is drawn and the player's **action is B** and the **co-player's action is B**: The player receives nothing (US$ 0). So does the co-player (US$ 0).

In a previous experiment, the co-players' action was **A** in about 60 out of 100 cases and **B** in about 40 out of 100 cases.

[next]

[comprehension 1]

Quiz



Welcome to the quiz.

Here you have the chance to check whether you have properly understood the rules of the game. Please answer the following questions.

Question 1:
Which of the following is correct? In the first round and the second round, my co-player is
- the same participant in both rounds.
- a different participant in each round.

[Option 2 is correct]

Question 2:
Which of the following is correct? On average, co-players
- choose A more often than B.
- choose B more often than A.
- choose A and B equally often.

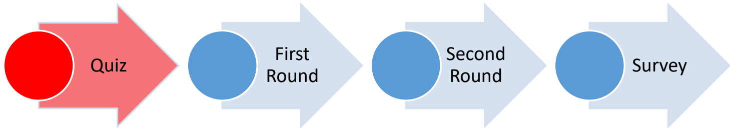
[Option 1 is correct]

Question 3:
Remember that only one of the two rounds counts for your payment, with equal chance. What does this mean?
- The outcome of round 1 is less important than the outcome of round 2.
- The outcomes of both rounds are equally important.
- The outcome of round 2 is less important than the outcome of round 1.

[option 2 is correct]

[comprehension 2]

Quiz



Question 4:
What is your payout if your action is A, your co-player's action is B, and the ball is red?
- US$ 0
- US$ 1
- US$ 3

[Option 1 is correct]

Question 5:
What is your payout if your action is A, your co-player's action is B, and the ball is green?
- US$ 0
- US$ 1
- US$ 3

[Option 2 is correct]

Question 6:
What is your payout if your action is B, your co-player's action is B, and the ball is green?
- US$ 0
- US$ 1
- US$ 3

[Option 1 is correct]

Question 7:
What is your payout if your action is B, your co-player's action is A, and the ball is green?
- US$ 0
- US$ 1
- US$ 3

[Option 3 is correct]

[check answers] [if correct / corrected: next]

Show payoff reminder

TREATMENT AA:
[elicitation; new screen; center vertically]

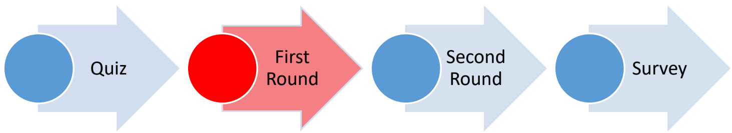
A final question, for which there is no right or wrong answer: Which action would you choose?

- Action A.
- Action B.

[force answer; then next.]

[decision 1]

First Round



Welcome to the first round of the game.

You are now a player in this game, where you can earn money if this round is selected for payout.

You are matched with another participant, your co-player for this round. Your co-player will choose an action, A or B, and a ball, red or green, will be drawn.

[TREATMENT AA]
In this round, your action, A or B, is **assigned** to you.

[TREATMENT RA]
Which action do you choose?

- A
- B

[instructions reminder box]
Remember: Your payoff is jointly determined by

- whether a red or a green ball is drawn from the urn, which contains 20 red and 80 green balls,
- whether your action is A or B, and
- whether your co-player's action is A or B.

In a previous experiment, the co-player's action was A in about 60 out of 100 cases and B in about 40 out of 100 cases.

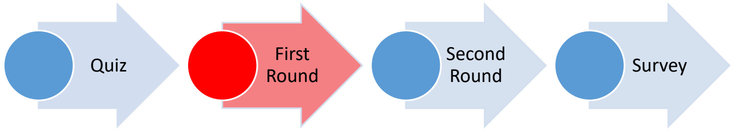
If a green ball is drawn, and

- your action is A, and your co-player chooses A: You receive US$ 1. Your co-player receives US$ 1.
- your action is A, and your co-player chooses B: You receive US$ 1. Your co-player receives US$ 3.
- your action is B, and your co-player chooses A: You receive US$ 3. Your co-player receives US$ 1.
- your action is B, and your co-player chooses B: You receive nothing (US$ 0). Your co-player receives nothing (US$ 0).

If a red ball is drawn, you and your co-player both receive nothing (US$ 0).

Please click ‘next’ to continue.
[next]

[TREATMENT AA: revelation, round 1 choice, new screen, center vertically]



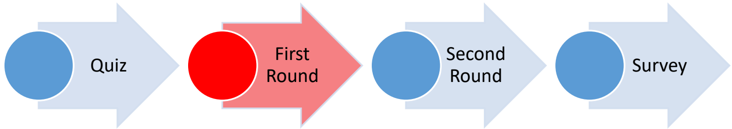
By assignment, your action in round 1 is:

{A/B}

[next]

8

[belief ball color 1, on separate screen]
First round: Questions

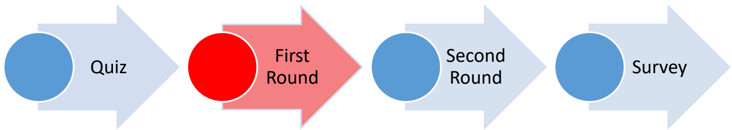


What is your gut feeling - is the color of the ball that was just drawn:

green or **red**?

[slider, 0-100]
[next]

[belief other's decision 1, on separate screen]
First round: Questions



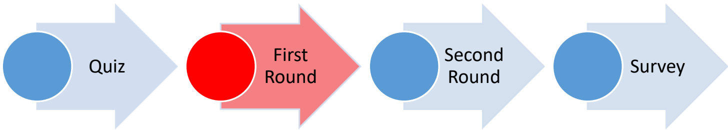
What is your gut feeling - did your co-player just choose:

A or **B**?

[slider, 0-100]
[next]

[Waiting room]

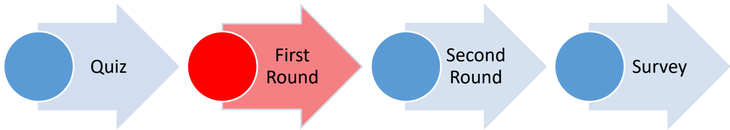
First round



Please wait while we match your action to your co-player's action.

[results 1]

First round: Results



Your action was **{A/B}**

Your co-player's action was **{A/B}**.

The ball drawn from the urn was **{green/red}**.

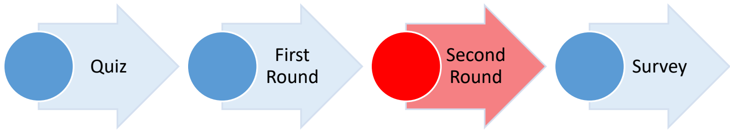
As a result, you earned **{payoff}** if this round is selected for payment.

Click on next to continue to the next round.

[next]

[decision 2; new screen]

Second Round



Welcome to the second round of the game, where you can earn money if this round is selected for payout.

You are matched with a different participant now, your co-player for this round. Your co-player will choose an action, A or B, and a ball, red or green, will be drawn.

TREATMENT AA: In this round, you choose your action, A or B.

Which action do you choose?

- A
- B

[instructions reminder box]

Remember: Your payoff is jointly determined by

- whether a red or a green ball is drawn from the urn, which contains 20 red and 80 green balls,
- whether your action is A or B, and
- whether your co-player's action is A or B.

In a previous experiment, the co-player's action was A in about 60 out of 100 cases and B in about 40 out of 100 cases.

If a green ball is drawn, and

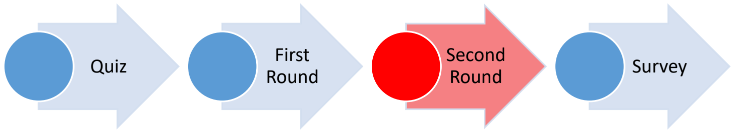
- your action is A, and your co-player chooses A: You receive US$ 1. Your co-player receives US$ 1.
- your action is A, and your co-player chooses B: You receive US$ 1. Your co-player receives US$ 3.
- your action is B, and your co-player chooses A: You receive US$ 3. Your co-player receives US$ 1.
- your action is B, and your co-player chooses B: You receive nothing (US$ 0). Your co-player receives nothing (US$ 0).

If a red ball is drawn, you and your co-player both receive nothing (US$ 0).

Please click 'next' to continue. [next]

[belief ball color 2, new screen]

Second round: Questions



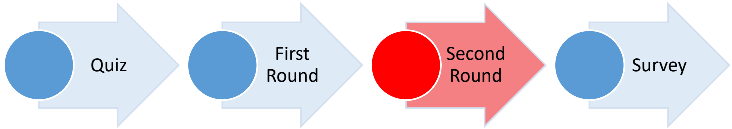
What is your gut feeling - is the color of that ball that was just drawn:

green or **red**?

[slider, 0-100]
[next]

[belief other's choice 2, on separate screen]

Second round: Questions



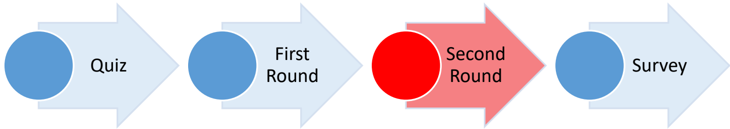
What is your gut feeling - did your co-player just choose:

A or **B**?

[slider, 0-100]
[next]

[elicitation of motivation]

Second round: Questions



CHANGERS
In round 2, why did you choose action 'x' and not action 'v' as in round 1?

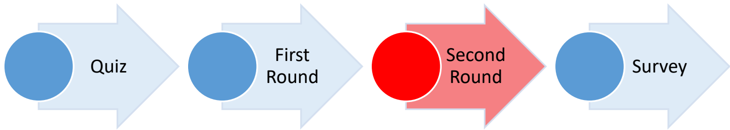
[1] Because I wish my action had been 'x' in round 1.
[2] Because my co-player played 'x' in round 1.
[3] Because I wanted to choose the opposite of my co-player's action in round 1.
[4] Because I wanted to learn something from trying the other action
[5] Because I have changed my opinion on what the best action is
[6] Other [please specify]: ______________________________

NO-CHANGERS
In round 2, why did you choose action 'x' as you did in round 1?

[1] Because I am glad that my action was 'x' in round 1.
[2] Because my co-player played 'x' in round 1.
[3] Because I wanted to choose the opposite of my co-player's action in round 1.
[4] Because nothing has changed.
[5] Other [please specify]: ______________________________

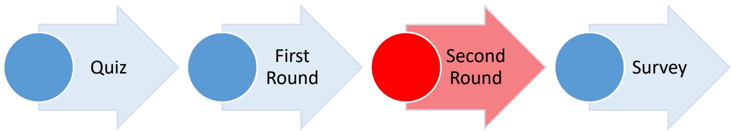
[Waiting room]

Second round



Please wait while we match your action to your co-player's action.

[results 2, on separate screen]



Results Round 2

Your action was **{A/B}**

Your co-player's action was **{A/B}**.

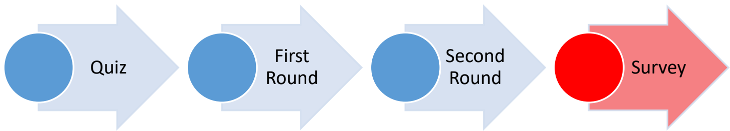
The ball drawn from the urn was **{green/red}**.

As a result, you earned **{payoff}** if this round is selected for payment.

[next]

[demographics]

Survey



Welcome to the survey. We ask you to answer a few questions before you complete the experiment.

What is your age?
[number input]

What is your gender?
- Male
- Female
- Other
- I prefer not to tell

What is the highest level of school you have completed or the highest degree you have received?
- Less than high school degree
- High School degree or equivalent (e.g. GED)
- some college, but no degree
- Associate degree
- Bachelor degree
- Graduate degree

If you had at least some college education, please tell us your major:
[free text input]

How do you see yourself: Are you in general a person who takes risk (10) or do you try to avoid risks (0)? Please self-grade your choice (0-10).
[slider, 0, 10]

[next]

[last page]

Completed

Thank you for your participation, your answers were transmitted.

Your payment consists of the fixed reward of US$ 0.50 and the payout from round 1 or round 2.

In your case, round **{1/2}** was randomly selected for payout, where you earned **{payoff}**. In total, you receive: **{payoff plus participation fee}**.

If you have any questions regarding this study, please write a mail to the study team natcoop@awi.uni-heidelberg.de.

[finish study]