How risk communication shapes individual response to climate change: an experimental study

Supplementary Information

Alberto Antonioni[1], Miguel A. González-Casado[1], Giulia Andrighetto[2,3], Francesca Lipari[4], Aron Szekely[2,5], Arne Traulsen[6], Ángel Sánchez[1,7,*]

[1]Grupo Interdisciplinar de Sistemas Complejos (GISC), Departamento de Matemáticas, Universidad Carlos III de Madrid, Leganés, Spain
[2]Institute of Cognitive Sciences and Technologies, Italian National Research Council, Rome, Italy
[3]Institute for Futures Studies, Stockholm, Sweden
[4]Department of Economic Analysis and Quantitative Economics, Universidad Complutense de Madrid, Spain
[5]Collegio Carlo Alberto, Turin, Italy
[6]Department of Theoretical Biology, Max-Planck-Institute for Evolutionary Biology, Plön, Germany
[7]Instituto de Biocomputación y Física de Sistemas Complejos (BIFI), Universidad de Zaragoza, Zaragoza, Spain

[*]Corresponding author: `anxo@math.uc3m.es`

This document provides supplementary material describing the full experimental interface presented to participants in the study. Each screen is represented in sequence, as shown to subjects during the experiment.

CONSENT TO PARTICIPATE IN RESEARCH

You are about to participate in a research study conducted by Anxo Sánchez, Professor of Applied Mathematics at the Department of Mathematics, Universidad Carlos III de Madrid. Your participation in this study is entirely voluntary. Please read the following information carefully and ask any questions you may have before deciding whether to participate.

PURPOSE OF THE STUDY

Our experiments are generally part of the IBSEN project, funded by the EU and designed to help understand human behavior. More information about the objectives of IBSEN and the expected advances in knowledge can be found at `http://www.ibsen-h2020.eu`.
The specific purpose of this experiment is to gather information about collective behavior in groups of people.

PARTICIPANTS

General population aged 18 or older.

PROCEDURES

If you volunteer to participate in this study, you will be asked to make simple decisions using this computer or mobile interface in a context where those decisions will affect your chances of receiving a financial reward, as well as the rewards of other participants. Your decisions will remain anonymous and cannot be linked to your identity. You will not incur any financial loss.
You will receive a fixed amount of 2 euros for your participation, plus a variable amount depending on your decisions and those of the other participants. On average, participants earn around 15 euros, but the actual amount may vary and there is no guaranteed minimum other than the fixed participation fee.
Payment will be made via PayPal, so you will need an active PayPal account.

POSSIBLE RISKS AND DISCOMFORTS

There are no foreseeable risks or discomforts.

CONFIDENTIALITY

Data about your actions during the experiment will be collected and used for research purposes. These data will be stored without being linked to your personal identity and will be placed in an Open Data Repository after the study is completed, in order to share with other researchers and not for commercial purposes, in accordance with EU research policy obligations.

VOLUNTARY PARTICIPATION AND WITHDRAWAL

Your participation in this research study is voluntary. You may refuse to participate without penalty. If you choose to participate, you are free to stop at any time without penalty, simply by quitting the interface and/or informing the researcher. If you do not complete the experiment, you will not receive any payment.
By participating in the experiment, you declare that you are at least 18 years old and fully capable and competent to understand the terms and conditions of this experiment.

RESEARCHER IDENTIFICATION

If you have any questions or concerns about this research, please contact Anxo Sánchez at anxo@math.uc3m.es.

BASIC DATA PROTECTION INFORMATION

DATA CONTROLLER: Universidad Carlos III de Madrid.
PROCESS IDENTIFICATION: Social Behavior (GISC)
PURPOSE: To conduct experiments on human behavior with economic incentives. The experiments present hypothetical situations to voluntary participants who receive payment based on their actions. The data are necessary to make payments and justify expenses to the funding agency.
EXERCISE OF RIGHTS: You may exercise your rights of access, rectification, erasure, restriction, portability, and objection by sending an email to dpd@uc3m.es.
ADDITIONAL INFORMATION: You may consult additional and detailed information on our Privacy Policy at `https://www.uc3m.es/protecciondedatos`

I have read the information provided above. By clicking the button below, I agree to participate voluntarily in this research study under the conditions described.

Page 1

WELCOME

Please wait while the other participants connect.

The experiment will begin at **16:00 (Madrid time)**. From that time, you will have **10 minutes** to read the experiment instructions.

Page 2

INSTRUCTIONS

You are required to answer the following questions to continue with the experiment.

You must choose one bet among six different options. Each bet has two possible outcomes — *HEADS* or *TAILS* — each with a 50% probability. Your final payment will depend on your choice on this screen and will be determined by:

- which of the six bets you select, and
- which of the two possible outcomes occurs.

For example, if you select Bet 4 and the outcome is *HEADS*, you receive **52 points**. If the outcome is *TAILS*, you receive **16 points**.
At the end of the experiment, a virtual coin toss will determine the actual outcome. If it lands on *HEADS*, you will earn the payoff listed in the left-hand column; if *TAILS*, the right-hand column. All six bets are listed in order. Please make your selection at the bottom of the screen.

BET	**HEADS**	**TAILS**
Bet 1	28 points	28 points
Bet 2	36 points	24 points
Bet 3	44 points	20 points
Bet 4	52 points	16 points
Bet 5	60 points	12 points
Bet 6	70 points	2 points

Make your selection below.

Page 3

WELCOME TO THE EXPERIMENT

On the next page, you will be able to read the experiment instructions. You have until **16:10 (Madrid time)** to read them.

Important: Once you proceed to the instruction page, you **will not** be able to go back.
When you are ready, click Next.

Page 4

INSTRUCTIONS

The goal of the game is to lose as few points as possible. There is a common fund to which everyone can contribute a portion of the points they receive. You may lose these points, and you may also lose additional points depending on whether the fund reaches a certain threshold or not. If the threshold is reached, you have a lower probability of losing points than if it is not.

You will now find a detailed description of the entire experiment.

Experiment dynamics: blocks and rounds
You and three other participants will form a group of four people. This group will remain fixed throughout the entire experiment. You will participate in 4 blocks, each consisting of 4 rounds.
At the beginning of each block, you will receive 100 points. During the 4 rounds of the block, you can contribute points to a common fund. Points not contributed to the fund may be kept under the conditions explained below. At the end of a block, you will move on to the next and receive another 100 points to allocate.

Rounds
Each round has two phases:

1) *Contribution:* In this phase, you may contribute to the common fund any number of the points you have for that round. In the first round of each block, you start with 100 points and choose how much to contribute.

2) *Payoff calculation:*
[[This section is shown only to participants in the **every round** treatment:]]

- After each round, you will be informed of the total amount contributed so far by your group.
- It will be checked whether the cumulative contribution across rounds has reached 200 points.
- If it has, each participant loses **26%** of their remaining points with a **10%** chance.
- If it has not, each participant loses **26%** with a **90%** chance.

[[This section is shown only to participants in the **last round** treatment:]]

- You will be informed of the total amount contributed across all 4 rounds after the final round only.
- Then, it will be checked whether this cumulative contribution has reached 200 points.
- If it has, each participant loses **100%** of their remaining points with a **10%** chance.
- If it has not, each participant loses **100%** with a **90%** chance.

Click Next to continue.

Page 5

INSTRUCTIONS: EXAMPLES

[[**These examples are shown only to participants in the *every round* treatment.**]]

Example 1: This is the first round of a block. You contribute 20 points to the common fund, and your three teammates contribute a total of 75 points. The fund total is 95 points, which is below 200. Therefore, you may lose 26% of your remaining points with a 90% probability. In your case, you had 80 points left, so you might lose 26% of 80, i.e., 20 points, with 90% probability.

Example 2: You are in the third round of a block. After the contribution phase, there are 222 points in the common fund, exceeding the 200-point threshold. Therefore, you may lose 26% of your remaining points with a 10% probability. You contributed 40 points in the first round, 13 in the second, and 11 in the third, leaving you with 36 points. Hence, you might lose 26% of 36 points, i.e., 9 points, with a 10% probability.

[[**These examples are shown only to participants in the *last round* treatment.**]]

Example 1: In the first round, you contribute 20 points and your teammates contribute 50 in total, summing to 70. In the second round, you contribute 18 and they contribute 64, totaling 82 for the round and 152 cumulative. In the third round, you contribute 15 and they contribute 26, totaling 41 and 193 cumulative. In the final round, you contribute 2 and they contribute 3, adding 5 more for a total of 198 points. Since the group did not reach 200 points, all may lose all their accumulated points with a 90% probability. In your case, that's 45 points, calculated as $100 - 20 - 18 - 15 - 2 = 45$.

Example 2: In the first round, you contribute 30 and your teammates 62, totaling 92. In the second round, you contribute 14 and they contribute 74, totaling 88 for the round and 166 cumulative. In the third round, you contribute 9 and they contribute 43, totaling 52 and 218 cumulative. In the final round, you contribute 0 and they contribute 1, totaling 1 point and 219 cumulative. Since the group exceeded 200 points, the chance of losing all remaining points is only 10%. In your case, that's 43 points, calculated as $100 - 30 - 14 - 9 - 0 = 43$.

After reading the examples, you will be asked some questions to ensure you understand the round mechanics.

Click Next to continue.

Page 6

CONTROL QUESTIONS

In this section, you will be asked a few short questions to check your understanding of the rules and structure of the experiment. Please answer them carefully.

Your answers will not affect your payment, but they are necessary to ensure that all participants understand how the experiment works.

Click Next to submit your answers and view feedback.

Page 7

FEEDBACK ON YOUR ANSWERS

Below, you will find the correct answers to the control questions along with explanations.

For each question, you will see:

- Whether your answer was correct or incorrect.
- A short explanation of the correct answer.

This is intended to clarify any misunderstandings before continuing with the experiment.

Click Next to proceed.

Page 8

ADDITIONAL INSTRUCTIONS

Preliminary Questions At the beginning of each block and before making your decisions, you will have the opportunity to earn extra points by answering a few questions. If you earn points, they are guaranteed gains — you cannot lose them later. These questions are unrelated to the content of the blocks and rounds.

Exchange Rate All points will be converted into real money at a rate of 50 points = 1 euro, plus an additional 2 euros if you complete the entire experiment.

Important Each phase has a limited but sufficient time for you to make your decision, as indicated by a countdown timer. If you do not make a decision in time, the computer will choose randomly for you. If you miss two decisions, you will be expelled from the experiment and will not receive any payment.

Click Next to continue.

Page 9

EXTRA QUESTIONS

Before making your decisions in this section, you have the opportunity to earn a few extra points.
You will answer questions over three screens before moving on to the decision phase.

Important: Each phase has a limited but sufficient amount of time, indicated by a countdown timer. If you do not make your decision in time, the computer will choose randomly on your behalf. If you are absent for more than two decisions, you will be expelled from the experiment and will not receive any payment.

Click Next when you are ready.

Page 10

EMPIRICAL EXPECTATIONS

Please indicate what you believe will be the average contribution of your three teammates (not including your own) in each of the 4 rounds of this block.
Remember that the sum of the average contributions from each participant cannot exceed 100.
You will earn 2 points if your estimate is sufficiently close to the actual value — that is, within 2 points of the real average.

Round	**1**	**2**	**3**	**4**
Average	________	________	________	________

Enter your answers and click Next to continue.

Page 11

NORMATIVE BELIEFS

Please indicate what you believe you and your teammates *should* contribute in each of the 4 rounds of this section.
Remember that the average contributions across all participants should not exceed 100 points in total.

Round	**1**	**2**	**3**	**4**
Average	________	________	________	________

Enter your answers and click Next to continue.

Page 12

NORMATIVE EXPECTATIONS

Please indicate what you believe your teammates think everyone (including you) *should* contribute in each of the 4 rounds of this block.

Remember that the sum of the average contributions for each participant cannot exceed 100 points.
You will earn 2 points if your estimate is sufficiently close to the real average — within 2 points.

Round	**1**	**2**	**3**	**4**
Average	________	________	________	________

Enter your estimates and click Next to continue.

Page 13

CONTRIBUTION ROUND

Below is a summary of your contributions and the group's total contributions in each round so far:

Round	1	2	3	Current
Your cumulative contribution	...	...	...	...
Group cumulative contribution	...	...	...	...

Choose how many points you wish to contribute in this round. You may contribute any amount between 0 and your remaining points.

Enter your decision and click Next to continue.

Page 14

ROUND FEEDBACK

Below is a summary of your cumulative contribution and the total group contribution.

Round	1	2	3	Current
Your cumulative contribution	...	...	...	...
Group total in fund	...	...	...	...

[[**This applies to participants in the *every round* treatment:**]]

- If the group reached 200 points: there is a 10% chance of losing 26% of your points.
- If the group did not reach 200 points: there is a 90% chance of losing 26%.
- Your loss for this round has been determined randomly.
- Examples:
  - *You lost* `X` points.
  - *You did not lose* any points.

[[**This applies to participants in the *last round* treatment, at the end of a block:**]]

- If the group reached 200 points: there is a 10% chance of losing 100% of your points.
- If the group did not reach 200 points: there is a 90% chance of losing 100%.
- Your loss has been determined randomly.
- Examples:
  - *You lost* `X` points.
  - *You did not lose* any points.

Your current balance is ... points.
Click Next to continue.

Page 15

Page 14 and 15 are repeated for 4 rounds. Then, participants go through another block of pages 10, 11, 12, and 13 again, followed by another repetition of page 14 and 15 for 4 rounds. Each block is repeated 4 times.