The NZAVS Economic Decisions Project

Claessens, S. (2020). The NZAVS Economic Decisions Project. *NZAVS Technical Documents, e30.*

Contents

1 Introduction

This technical document describes the methodology for the NZAVS Economic Decisions Project. The project is an online behavioural study that runs alongside the main New Zealand Attitudes and Values Study questionnaire. The project uses a series of real-time one-shot anonymised incentivised economic games to tap into participants' social preferences. The study's methodology was initially adapted from Peysakhovich, Nowak, & Rand (2014), but has since expanded to include more behavioural measures. The games are designed to measure social preferences like altruism, trust, reciprocity, cooperation, norm-enforcing punishment, conformity, and rule following. The study was designed by Professor Chris Sibley, Professor Ananish Chaudhuri, Professor Quentin Atkinson, and PhD student Scott Claessens.

2 Study Procedure

The study is coded using oTree software (Chen, Schonger, & Wickens, 2016). In the study, participants who agree to take part are booked into an hour-long online session on a midweek evening. As the study is conducted in real time, participants must be present at the beginning of the session and focused throughout. After clicking the oTree link to begin the study, participants sequentially work through a series of eight one-shot economic games in a randomised order (see Data Collection and Economic Games Measures for more information). For each game, they first read through instructions for the game, then complete a comprehension question to check their understanding, and then submit their decisions for the game. Participants are given the correct answer after answering the comprehension question. For the main decisions, we used the strategy method, where participants submit decisions for all roles in multi-role games. In the games, participants played for "points" which were converted to NZD at a rate of 1 point = $0.035.

Once participants submit their decisions for all eight games, they must wait for everyone else in the session to complete the games too, and then (in real time) the computer randomly matches all participants in the session into groups and executes the decisions that the participants made. These decisions ultimately determine the participants' payment for the study. Participants earn a show-up fee of $20 for taking part, plus anywhere between $10 and $35 based on the decisions they make in the study. Name and bank account details are collected at the end of the study. For security purposes, this information is encrypted while stored online and later decrypted on a local computer for payment.

Participants have a 55 minute time limit to complete the games. As the study involves real-time matching between participants, participants cannot pause their completion of the questionnaire and return to it later, as other participants would be left waiting to match with them. If participants take longer than 55 minutes, the software skips them ahead to the waiting lobby and treats them as if they were simulated players (*i.e.*, submitting median responses from past research). Timeouts are still paid the $20 show-up fee, but no bonus payment.

Ethical approval for this project was given on 16th July 2018 for three years (ref: 021666), with an ethics amendment for the second wave of data collection approved on 4th September 2020.

3 Data Collection

3.1 Wave 1 (2019)

In the first wave of data collection for this project, we included the following economic games: Public Goods Game, Dictator Game, Trust Game, Stag Hunt Game, Ultimatum Game, Third-Party Punishment Game, Second-Party Punishment Game, and Stag-Hunt with Punishment Game (see Economic Games Measures for more information).

We included participants in our sample frame who: had completed Wave 4 of the study (*n* = 12,189); had also completed Wave 9 and/or Wave 10 (*n* = 8,095); had not subsequently withdrawn from the study at the time of sampling (*n* = 7,833); had consistently indicated at Wave 9 and 10 that they would be willing to participate in an additional online study (*n* = 4,181); had a valid email address (*n* = 4,040); were living in New Zealand (*n* = 3,955); were younger than 70 at the time of sampling (*n* = 3,374); and had a valid cell or landline number (*n* = 3,345). Of these 3,345 participants, we attempted to contact 3,063 about an additional study involving "economic decision-making in groups". We managed to successfully contact 2,731 about the study.

Participants were contacted initially by phone and then, if they agreed to participate, over email in the days leading up to their allocated study session. 1,662 participants did not participate and 24 participants either were not paid or did not complete the study in time, resulting in a final sample of 1,045 participants (631 females; age *M* = 50.5 years, *SD* = 12 years).

The first wave of data collection for this project was conducted between 18th February and 25th July 2019 (though we took a break mid-way through data collection due to the Christchurch terrorist attack in March 2019). Study sessions contained between 14 and 97 participants, and were conducted on midweek evenings (between 6pm and 8pm). Participants knew that they were playing with others recruited from the New Zealand Attitudes and Values Study, but were not aware of how many people were present in any particular session. On average, participants took 22 minutes to complete the eight economic games (SD = 7.49 mins, range = 6 - 52 mins; Figure 1).

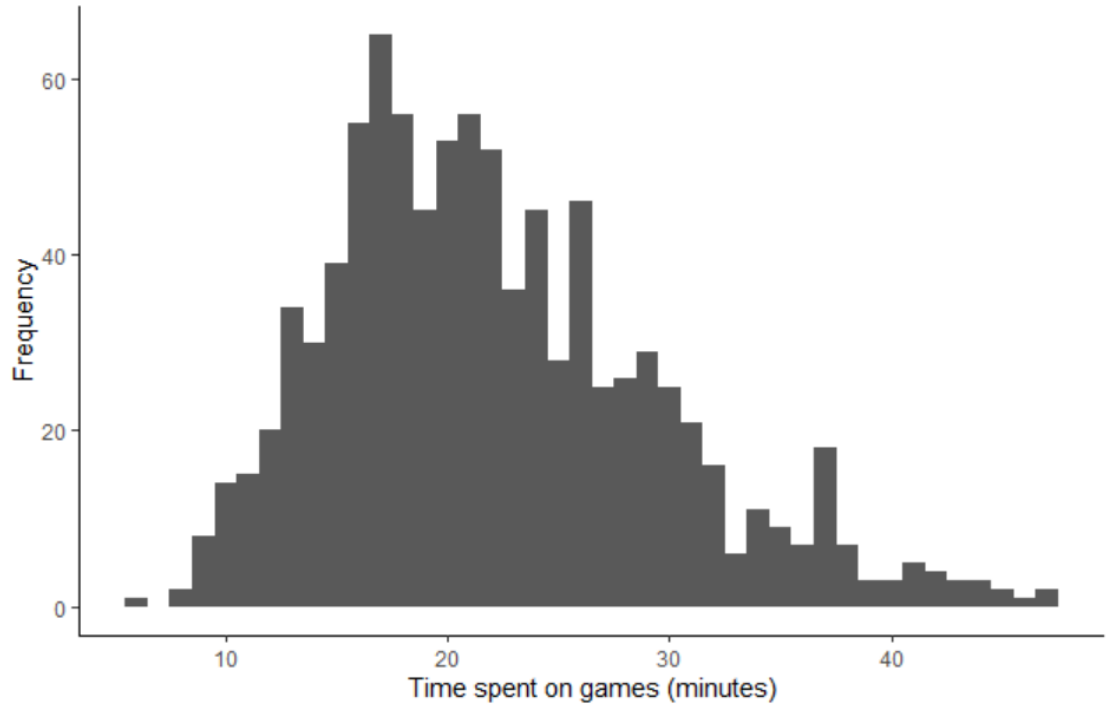


Figure 1. Time spent on economic games in Wave 1.

Participants were paid a fixed $20 NZD show-up fee, plus a bonus payment of between $10 - 35 (M = $25.17, SD = $2.47; Figure 2) depending on the decisions of themselves and others. In total, we spent $41,826 on participant reimbursements in Wave 1.

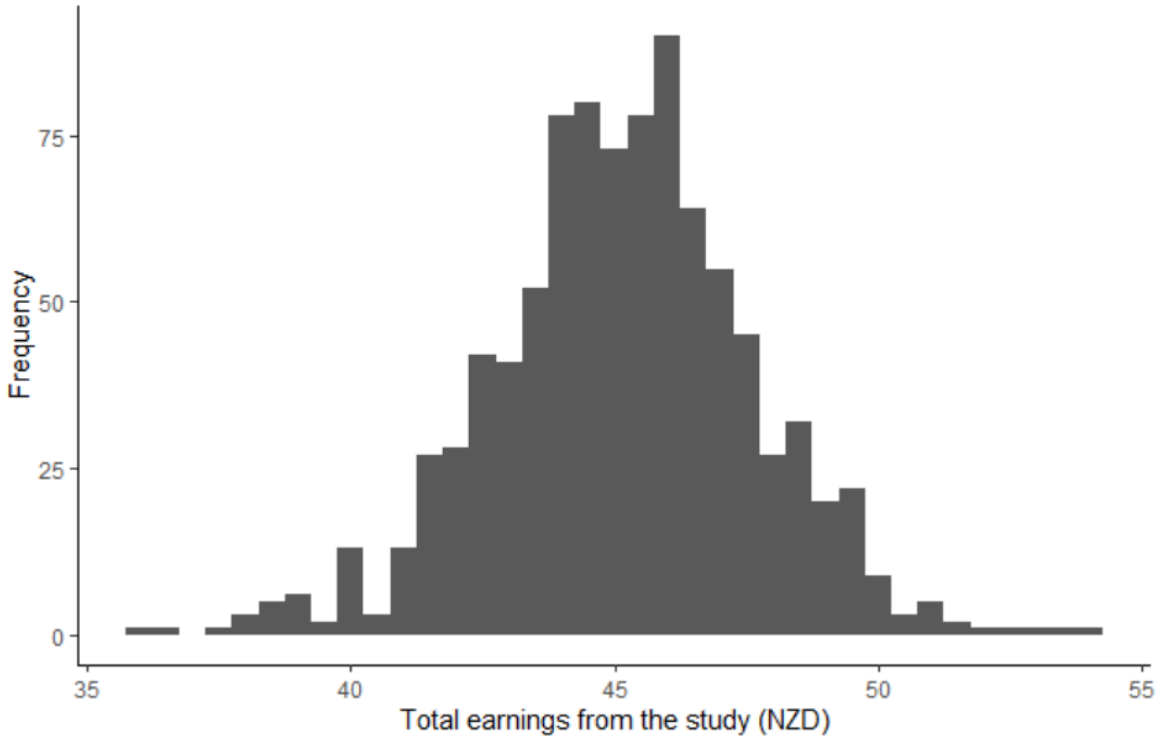


Figure 2. Total earnings from the study (NZD) in Wave 1.

3.2 Wave 2 (2020)

In the second wave of data collection for this project, we included the following economic games: Public Goods Game, Dictator Game, Trust Game, Ultimatum Game, Third-Party Punishment Game, Second-Party Punishment Game, Rule Following Task, and BEAST (see Economic Games Measures for more information). In other words, we swapped out the Stag Hunt Game and Stag-Hunt with Punishment Game for the Rule Following Task and BEAST.

In the second wave, we attempted to contact every participant who had participated in the first wave and had not since withdrawn from the NZAVS Economic Decisions Project or the NZAVS more generally. This resulted in a sample frame with 997 participants. In this wave, we did not call participants directly but instead emailed them with another invitation to participate in the same study. Of the participants we emailed, 636 participants completed the second wave (64% retention rate). 5 of these participants did not complete the study in time, resulting in a final sample of 631 participants (414 females; age *M* = 50.6 years, *SD* = 12.5 years).

The second wave of data collection was conducted between 19th October and 11th November 2020. Study sessions contained between 26 and 128 participants, and were again conducted

on midweek evenings (between 6pm and 8pm). On average, participants took 24 minutes to complete the eight economic games (SD = 8 mins, range = 9 - 55 mins; Figure 3).

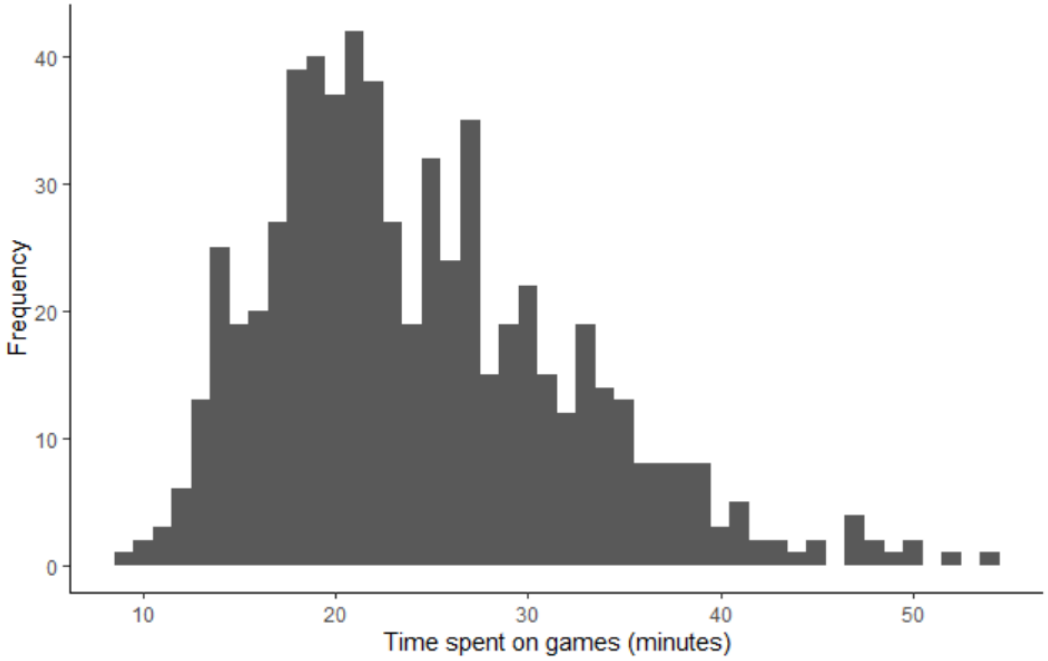


Figure 3. Time spent on economic games in Wave 2.

Participants were paid a fixed $20 NZD show-up fee, plus a bonus payment of between $10 - 35 (M = $21.39, SD = $2.63; Figure 4) depending on the decisions of themselves and others. In total, we spent $26,219 on participant reimbursements in Wave 2.

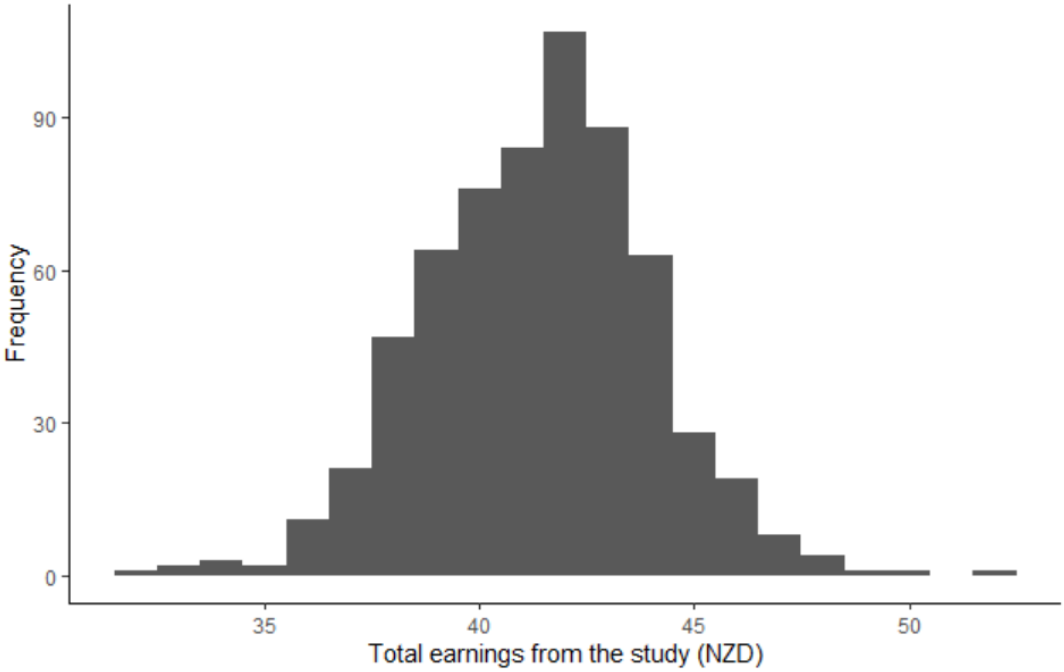


Figure 4. Total earnings from the study (NZD) in Wave 2.

4 Economic Game Measures

4.1 Public Goods Game

The Public Goods Game is a measure of collective action and cooperation in social dilemmas. This game was copied verbatim from Peysakhovich *et al.* (2014). This variable loads onto the "cooperation" latent variable. We used this game in both Wave 1 (egame.PGG.T10) and Wave 2 (egame.PGG.T11).

On the first page, participants read the following instructions:

> *In this task you are matched with three other people.*
>
> *All of you start with 100 points.*
>
> *Each of you will choose how much of these 100 points to contribute to a group project, and how much to keep for yourself.*
>
> *All individuals decide at the same time.*
>
> *All contributed points are doubled and split evenly among the group.*
>
> *Thus, for every 2 points you contribute, you only receive one point from the project. So contributing more points always increases your groups' total payoff, but you always end up with more money if you contribute less.*

On the next page, participants answer the following comprehension question (correct answer is C):

> *What contribution BY YOU maximises payoffs for the GROUP? What about for yourself?*
>
> *(A) Contributing 100 maximises payoffs for both the group and myself*
> *(B) Contributing 0 maximises payoffs for both the group and myself*
> *(C) Contributing 100 maximises payoffs for the group but contributing 0 maximises my own payoff*

On the final page, participants make their decision:

> *How many points do you wish to contribute to the group project? [0 - 100]*

In Wave 1, participants contributed an average of 49 points (SD = 32 points, range = 0 – 100 points; Figure 5). In Wave 2, participants contributed an average of 50 points (SD = 31 points, range = 0 – 100 points; Figure 6).

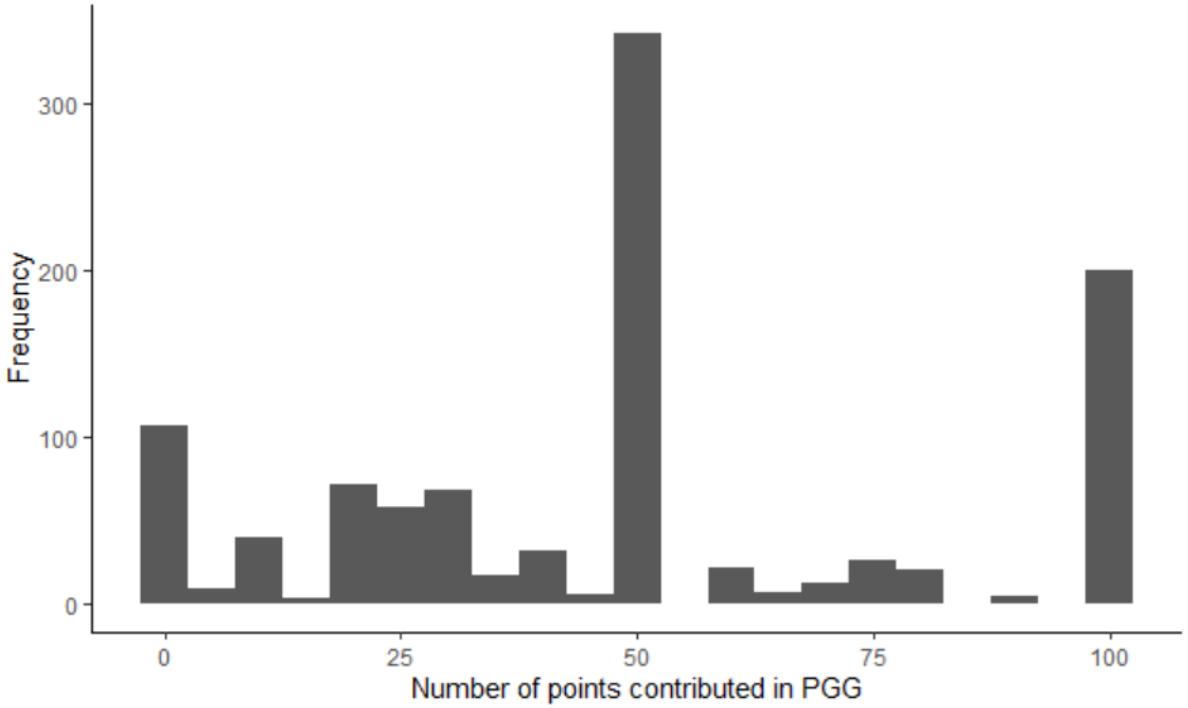


Figure 5. Number of points contributed in the Public Goods Game in Wave 1.

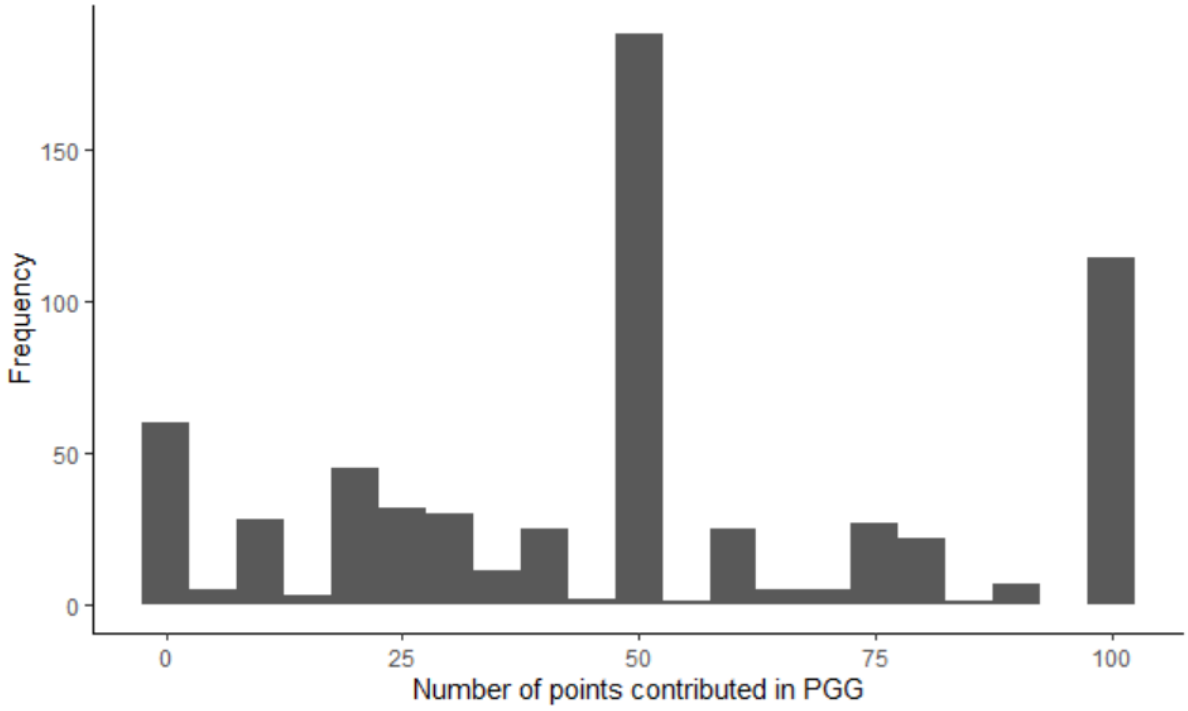


Figure 6. Number of points contributed in the Public Goods Game in Wave 2.

4.2 Dictator Game

The Dictator Game is a measure of altruistic giving. This game was copied verbatim from Peysakhovich *et al.* (2014). This variable loads onto the "cooperation" latent variable. We used this game in both Wave 1 (egame.DG.T10) and Wave 2 (egame.DG.T11).

On the first page, participants read the following instructions:

> *In this task you are matched with one other person.*
>
> *One of you will be Person A, one of you will be Person B.*
>
> *Person A starts with 100 points, and Person B starts with 0 points.*
>
> *This task has one single decision: Person A will choose how many of the 100 points to transfer to Person B.*
>
> *Person B will get the number of points Person A transfers, and Person A will get to keep the rest.*

On the next page, participants answer the following comprehension question (correct answer is A):

> *What happens if Person A transfers 20 points?*
>
> *(A) A keeps 80 points and B gets 20 points*
> *(B) Both get 20 points*

On the final page, participants make their decision:

> *If you are Person A, how many points will you transfer to Person B? [0 - 100]*

In Wave 1, participants gave an average of 38 points (SD = 20 points, range = 0 –100 points; Figure 7). In Wave 2, participants gave an average of 36 points (SD = 20 points, range = 0 – 100 points; Figure 8).

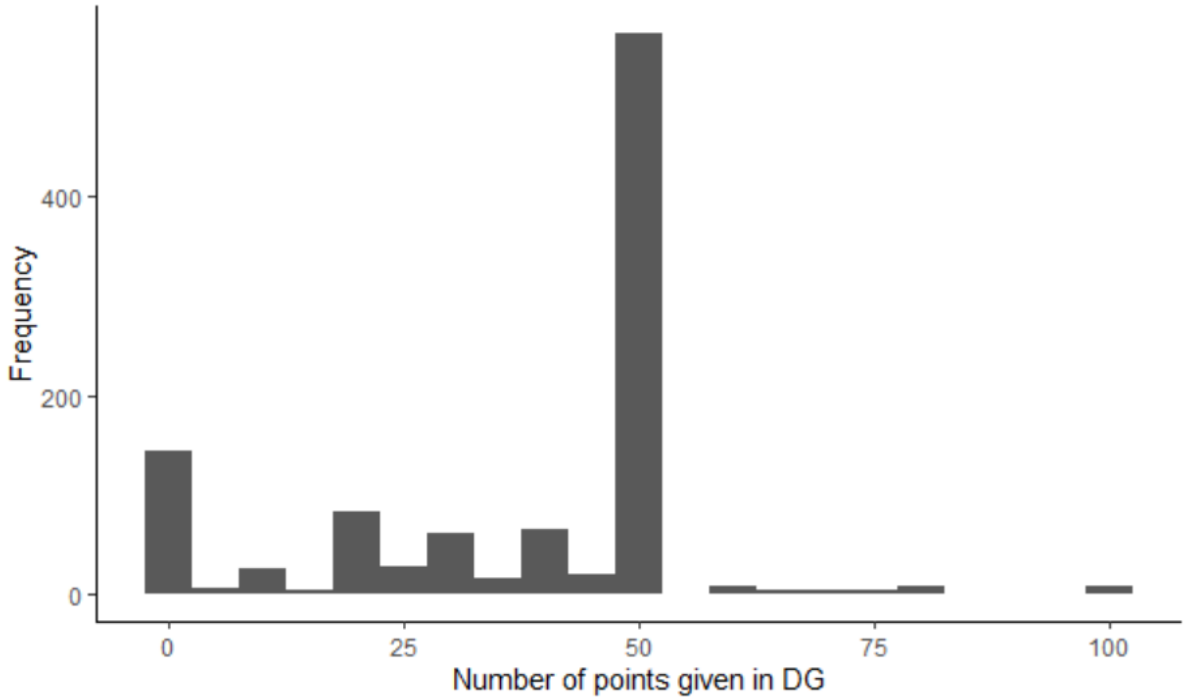


Figure 7. Number of points given in the Dictator Game in Wave 1.

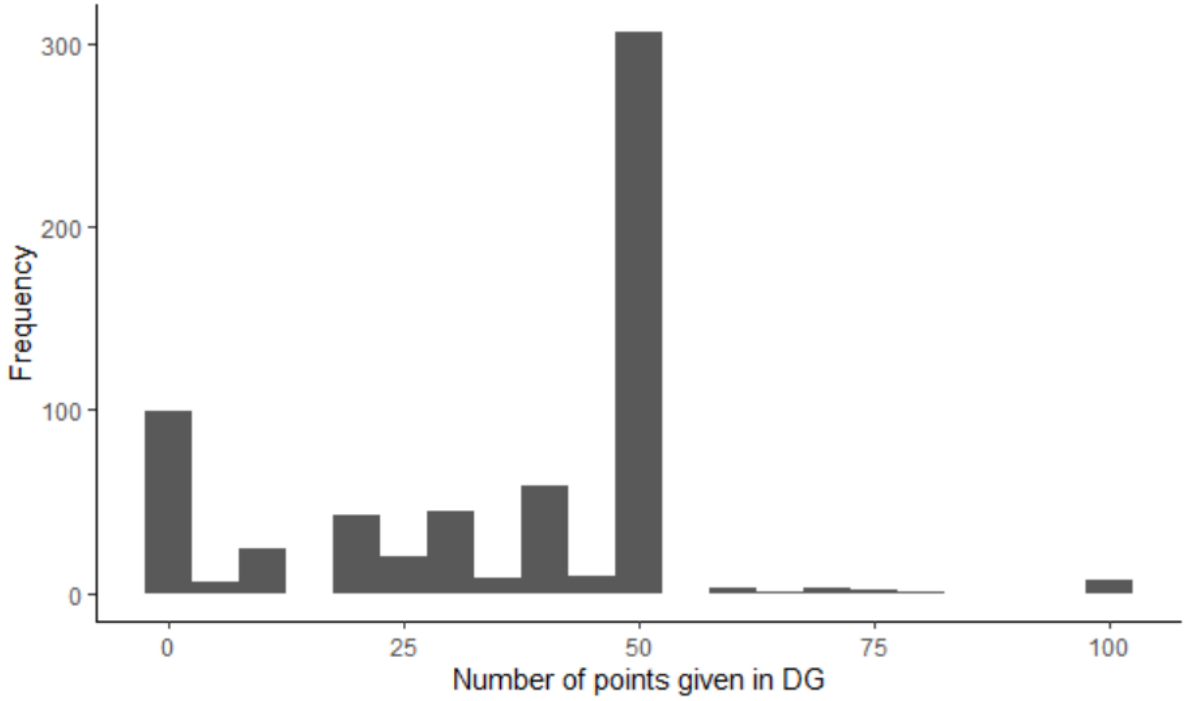


Figure 8. Number of points given in the Dictator Game in Wave 2.

4.3 Trust Game

The Trust Game is a measure of trust and reciprocal giving. This game was copied verbatim from Peysakhovich *et al.* (2014). This game creates two variables as there are two roles: the "first move" initial giving decision, and the "second move" returning decision. These variables both load onto the "cooperation" latent variable. We used this game in both Wave 1 (egame.TG1.T10 / egame.TG2.T10) and Wave 2 (egame.TG1.T11 / egame.TG2.T11).

On the first page, participants read the following instructions:

> *In this task you are matched with one other person.*
>
> *One of you will be Person A, the other will be Person B.*
>
> *Both of you start with 50 points.*
>
> *First, Person A makes a choice, then Person B responds.*
>
> *1. Person A can choose to transfer their 50 points or not. If Person A transfers 50 points then it is TRIPLED and given to Person B (so Person B now has 200 points).*
> *2. Person B can then choose how many of the points they want to transfer back to Person A (between 0 and 150). This latter amount is not tripled.*

On the next page, participants answer the following comprehension question (correct answer is A):

> *What happens if Person A transfers 50 points and Person B transfers back 25 points?*
>
> *(A) Person A earns 25 points, Person B earns 175 points*
> *(B) Person A earns 50 points, Person B earns 50 points*
> (C) *Person A earns 100 points, Person B earns 100 points*

On the next page, participants make their decision in the Person A (giving) role:

> *If you are Person A, do you want to transfer your 50 points to Person B?*
>
> - *No transfer*
> - *Transfer 50 points*

On the final page, participants make their decision in the Person B (returning) role:

> *If you are Person B and Person A transfers you 50 points (which is tripled to 150), how many points do you want to transfer back to A? [0 - 150]*

In Wave 1, 733 / 1,045 participants (70%) transferred the 50 points in the Person A role, and participants returned an average of 77 points in the Person B role (SD = 29 points, range = 0 – 150 points; Figure 9). In Wave 2, 454 / 636 participants (71%) transferred the 50 points in the Person A role, and participants returned an average of 77 points in the Person B role (SD = 32 points, range = 0 – 150 points; Figure 10).

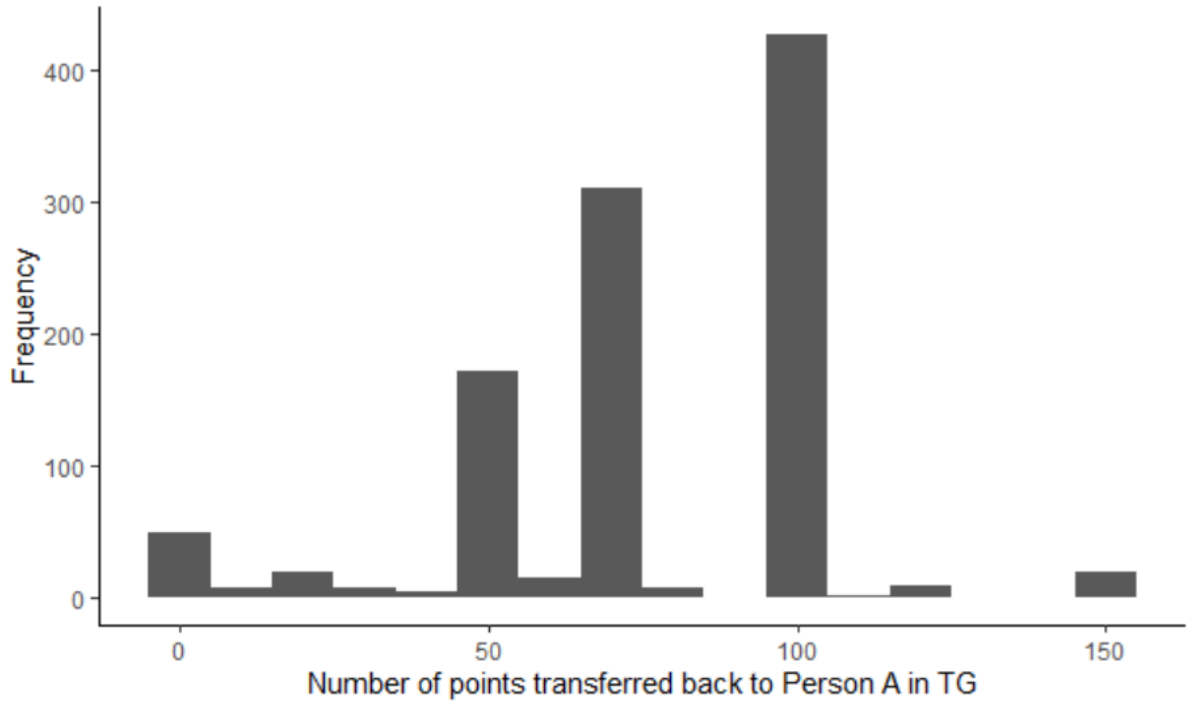


Figure 9. Number of points transferred back to Person A in the Trust Game in Wave 1.

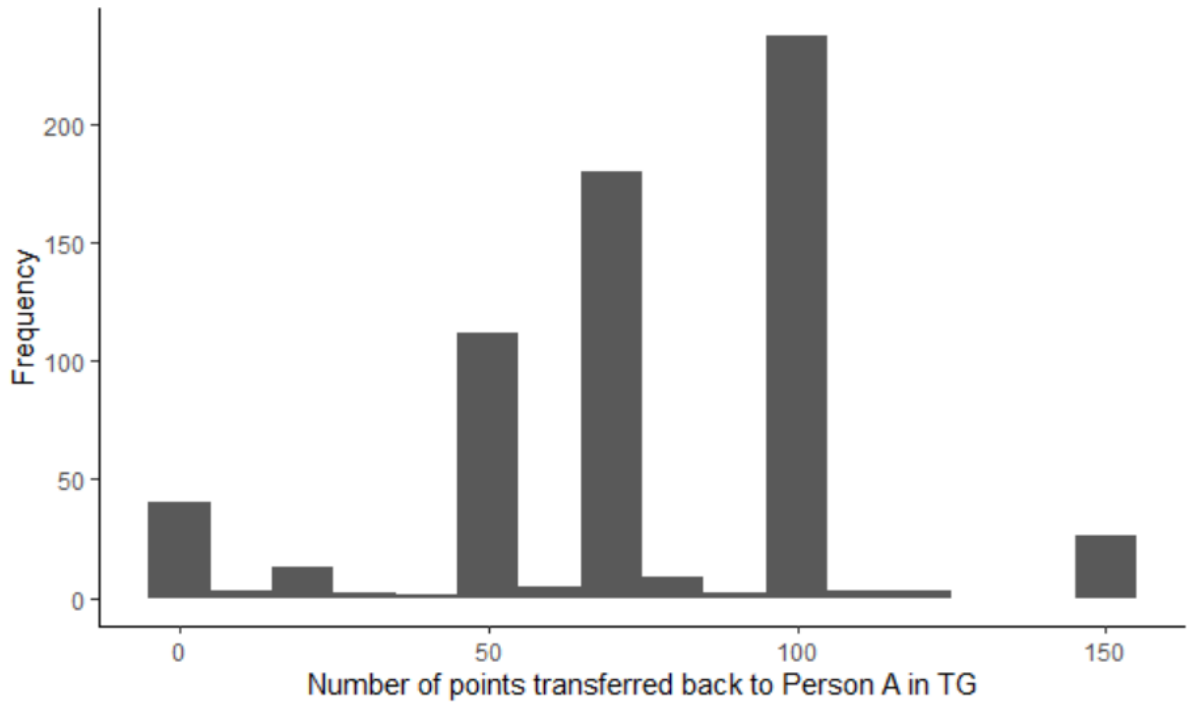


Figure 10. Number of points transferred back to Person A in the Trust Game in Wave 2.

4.4 Stag Hunt Game

The Stag Hunt Game is a measure of coordination. This game was adapted from the Public Goods Game by our research team, changing the payoff matrix to create a coordination problem rather than a social dilemma. This variable loads onto the "cooperation" latent variable. We only used this game in Wave 1 (egame.SH.T10).

On the first page, participants read the following instructions:

> *In this task you are matched with three other people.*
>
> *All of you start with 100 points.*
>
> *Each of you will choose whether to contribute 30 points to a group project.*
>
> *All individuals decide at the same time.*
>
> *If all people contribute, the group project is successful. In this case, all contributed points will be doubled and split evenly among the group.*
>
> *If only one, two, or three people contribute, the group project is not successful, and all the points in it are lost.*

On the next page, participants answer the following comprehension question (correct answer is C):

> *If you contribute 30 points to the group project, but no one else does, how many points do you end this task with?*
>
> *(A) 130 points (100 start + 30)*
> *(B) 100 points (100 start + 0)*
> (C) *70 points (100 start - 30)*

On the final page, participants make their decision:

> *Will you contribute 30 points to the group project?*
>
> - *Contribute 30 points*
> - *Do not contribute 30 points*

In Wave 1, 951 / 1,045 participants (91%) contributed 30 points to the group project.

4.5 Ultimatum Game

The Ultimatum Game is a measure of cooperation, fairness, and altruistic punishment. This game was copied verbatim from Peysakhovich *et al.* (2014). This game creates two variables as there are two roles: the offer decision, and the minimum-acceptable-offer decision. This second variable loads onto the "punishment" latent variable. We used this game in both Wave 1 (egame.UG1.T10 / egame.UG2.T10) and Wave 2 (egame.UG1.T11 / egame.UG2.T11).

On the first page, participants read the following instructions:

> *In this task you are matched with one other person.*
>
> *One of you will be Person A, one of you will be Person B.*
>
> *Person A starts with 100 points and Person B starts with 0 points.*
>
> *First Person A makes a choice, then Person B responds.*
>
> *Person A will make an offer on how to split the 100 points with Person B.*
>
> *Person B will either accept or reject this offer. If Person B accepts the offer, then B will get the offered amount and A will keep the rest. If Person B rejects the offer then both individuals will get 0 points.*

On the next page, participants answer the following comprehension question (correct answer is C):

> *What happens if Person B accepts an offer of 20 points? What happens if Person B rejects this offer?*
>
> *(A) If B accepts this offer then A gets 80 and B gets 20, if B rejects then A gets 80 and B gets 0*
> *(B) If B accepts this offer than A gets 0 and B gets 0, if B rejects then A gets 0 and B gets 0*
> *(C) If B accepts this offer then A gets 80 and B gets 20, if B rejects then both get 0*

On the next page, participants make their decision in the Person A (offer) role:

> *If you are Person A, what amount will you offer to Person B? [0 - 100]*

On the final page, participants make their decision in the Person B (minimum-acceptable-offer) role:

> *If you are Person B, what is your minimum acceptable offer? That is, if the offer that Person A gives you is below this, you would reject and if the offer A gives you is above or equal to this, you would accept. [0 - 100]*

In Wave 1, participants offered 46 points on average (SD = 13 points, range = 0 – 100 points) and gave a minimum-acceptable-offer of 36 points on average (SD = 17 points, range = 0 – 100 points; Figure 11). In Wave 2, participants offered 46 points on average (SD = 12 points, range = 0 – 100 points) and gave a minimum-acceptable-offer of 34 points on average (SD = 17 points, range = 0 – 100 points; Figure 12).

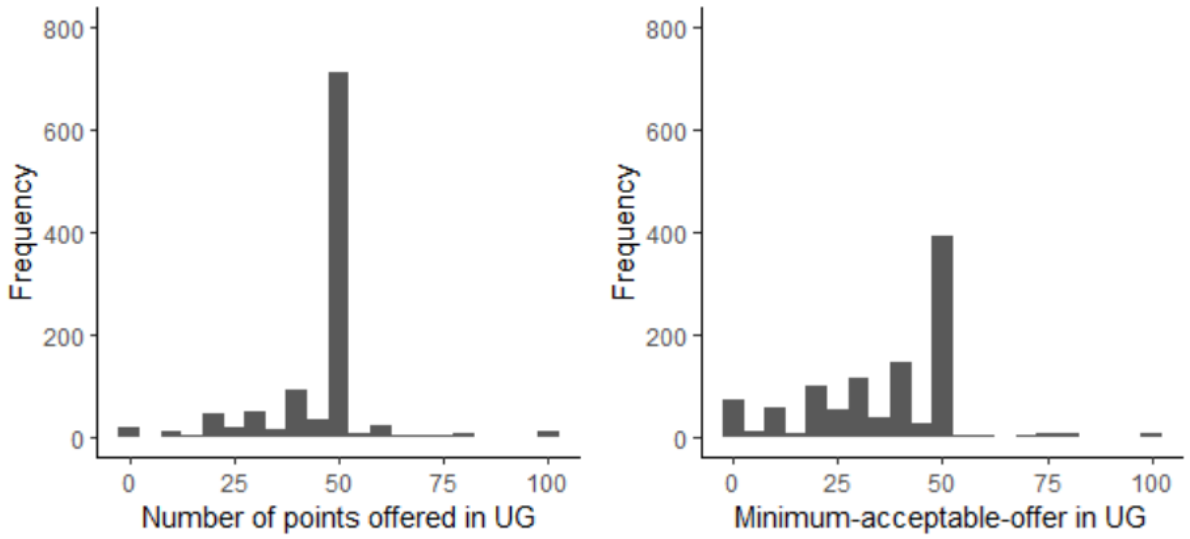


Figure 11. Distribution of decisions in the Ultimatum Game in Wave 1.

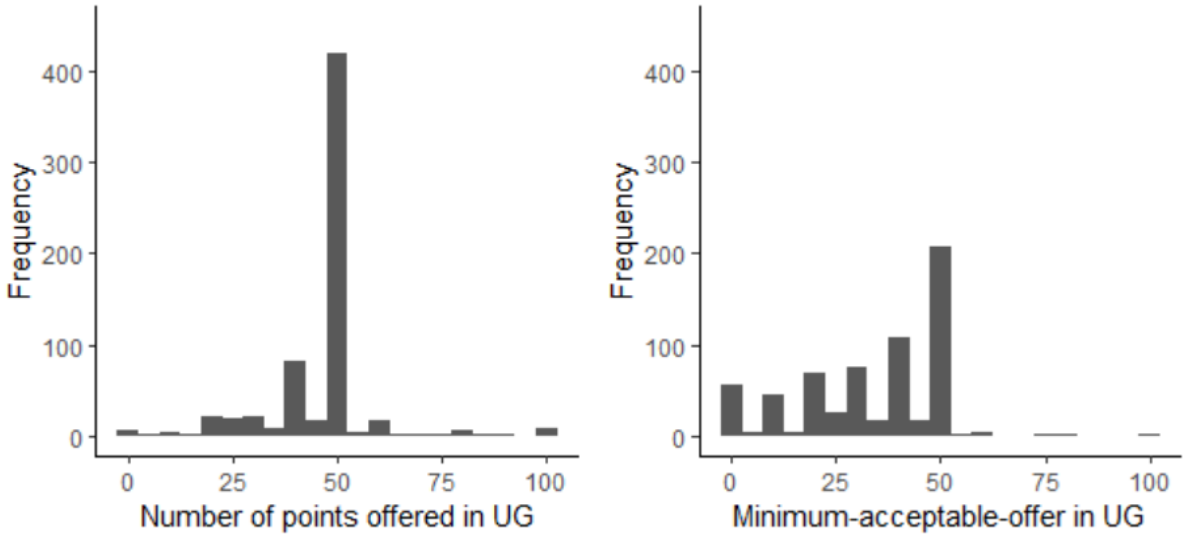


Figure 12. Distribution of decisions in the Ultimatum Game in Wave 2.

4.6 Third-Party Punishment Game

The Third-Party Punishment Game is a measure of altruistic punishment from third parties. This game was copied verbatim from Peysakhovich *et al.* (2014). This game creates two variables: the decision to take or not take, and the punishment decision. This second variable loads onto the "punishment" latent variable. We used this game in both Wave 1 (egame.TPP1.T10 / egame.TPP2.T10) and Wave 2 (egame.TPP1.T11 / egame.TPP2.T11).

On the first page, participants read the following instructions:

> *In this task you are matched with two other people.*
>
> *One of you will be Person A, one of you will be Person B, one of you will be Person C.*
>
> *All individuals start with 100 points.*
>
> *First, Person A makes a choice, then Person C responds.*
>
> *Person A can choose to take or not take from Person B.*
>
> *If A takes, Person B loses 50 points and A gains 30 points.*
>
> *If A takes, then Person C can choose to remove points from A. Person C can remove up to 100 points from A.*
>
> *Person C must pay 1 point for every 5 points they remove from A. Person B is passive in this task and makes no decisions.*
>
> *NOTE: Removed points are completely removed from the task, they are not 'taken' by Person C.*

On the next page, participants answer the following comprehension question (correct answer is A):

> *When can Person C remove points from Person A?*
>
> *(A) C can only choose to remove points from A if A chooses to take*
> *(B) C can always remove points from A*
> *(C) C can never remove points from A*

On the next page, participants make their decision in the Person A (taking) role:

> *If you are Person A, will you take from Person B?*
>
> - *Don't take*
> - *Take*

On the final page, participants make their decision in the Person C (punishing) role:

> *If you are Person C, how many points will you remove from Person A if they take? [0 - 100] (Reminder: if A chooses to take, B loses 50 points and A gains 30 points.)*

In Wave 1, 190 / 1,045 participants (18%) chose to take in the Person A role, and participants removed an average of 44 points in the Person C role (SD = 34 points, range = 0 – 100 points; Figure 13). In Wave 2, 118 / 636 participants (19%) chose to take in the Person A

role, and participants removed an average of 45 points in the Person C role (SD = 34 points, range = 0 – 100 points; Figure 14).

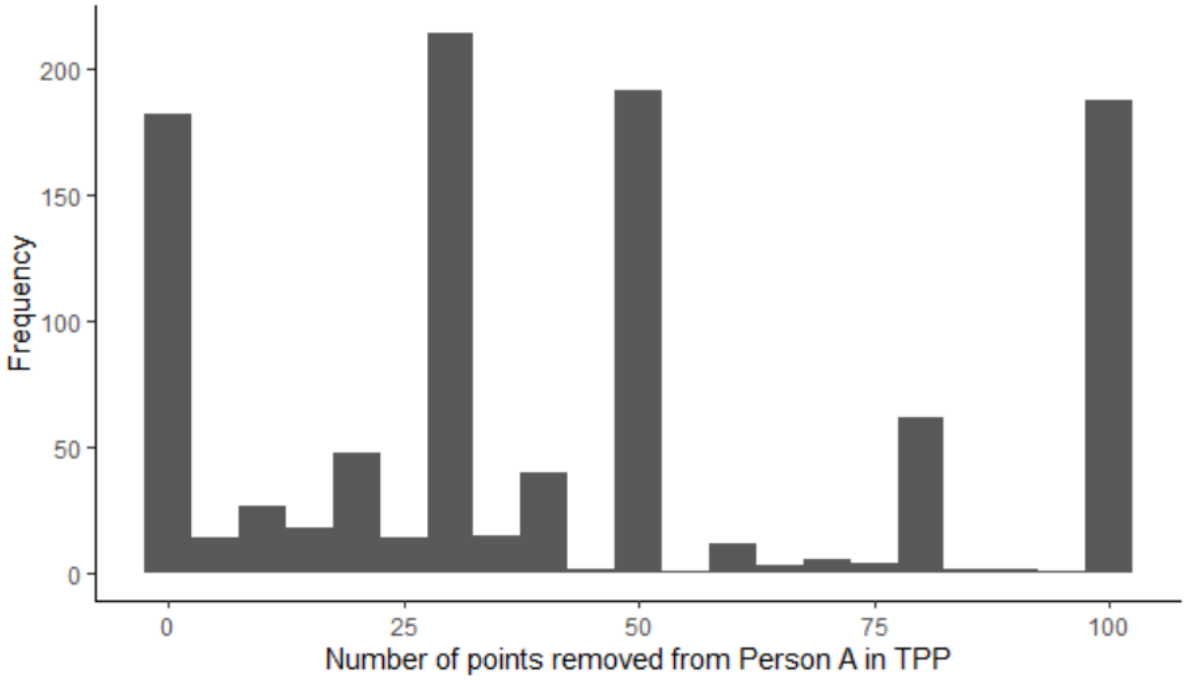


Figure 13. Number of points removed from Person A in the Third-Party Punishment Game in Wave 1.

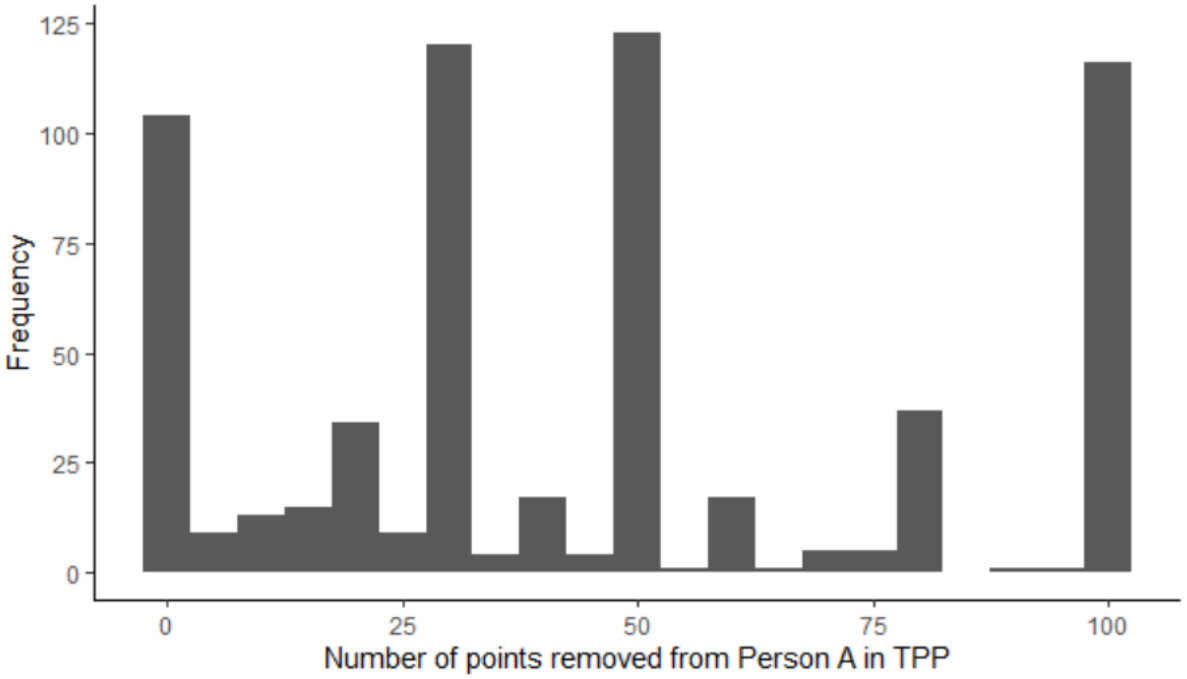


Figure 14. Number of points removed from Person A in the Third-Party Punishment Game in Wave 2.

4.7 Second-Party Punishment Game

The Second-Party Punishment Game is a measure of cooperation and altruistic punishment. This game was copied verbatim from Peysakhovich *et al.* (2014). This game creates three variables: the decision to cooperate or defect in a Prisoner's Dilemma, punishment of cooperators, and punishment of defectors. This third variable (punishment of defectors) loads onto the "punishment" latent variable. We used this game in both Wave 1 (egame.SPP1.T10 / egame.SPP2.T10 / egame.SPP3.T10) and Wave 2 (egame.SPP1.T11 / egame.SPP2.T11 / egame.SPP3.T11).

On the first page, participants read the following instructions:

> *In this task you are matched with one other person.*
>
> *One of you will be Person A, one of you will be Person B.*
>
> *Both individuals start with 100 points.*
>
> *This task has two phases. In each phase, both people choose at the same time.*
>
> *The transfer phase*
>
> *In the transfer phase, both people will choose to transfer 30 of their points to the other person or not. Any points transferred are doubled and given to the other person.*
>
> *The penalty phase*
>
> *In the penalty phase, each person then chooses whether they want to remove up to 50 points from the other person, based on the other person's decision in the transfer phase. For every 5 points someone wants to remove from the other person, they must pay 1 point.*
>
> *NOTE: Removed points are completely removed from the task, they are not 'taken' by you.*

On the next page, participants answer the following comprehension question (correct answer is B):

> *If Person B transfers and Person A doesn't, how many points will they each have at the end of the transfer phase?*
>
> *(A) A will have 100 (100 start - 0 transferred), B will have 130 (100 start - 30 transferred + 60 received)*
> *(B) A will have 160 (100 start + 60 received - 0 transferred), B will have 70 (100 start - 30 transferred)*
> *(C) Both will have 130*

On the next page, participants make their transfer phase decision:

> *Will you transfer 30 points to the other person?*
>
> - *Transfer*
> - *Don't transfer*

On the final page, participants make their penalty phase decisions:

Depending on if the other person transfers, how many points would you like to remove from them?

If the other DOES TRANSFER, I will remove this many points... [0 - 50]

If the other DOESN'T TRANSFER, I will remove this many points... [0 - 50]

In Wave 1, 891 / 1,045 participants (85%) chose to cooperate in the transfer phase. Participants removed an average of 9 points from cooperators (SD = 16 points, range = 0 – 50 points) and removed an average of 27 points from defectors (SD = 21 points, range = 0 – 50 points; Figure 15). In Wave 2, 537 / 636 participants (84%) chose to cooperate in the transfer phase. Participants removed an average of 11 points from cooperators (SD = 16 points, range = 0 – 50 points) and removed an average of 28 points from defectors (SD = 20 points, range = 0 – 50 points; Figure 16).

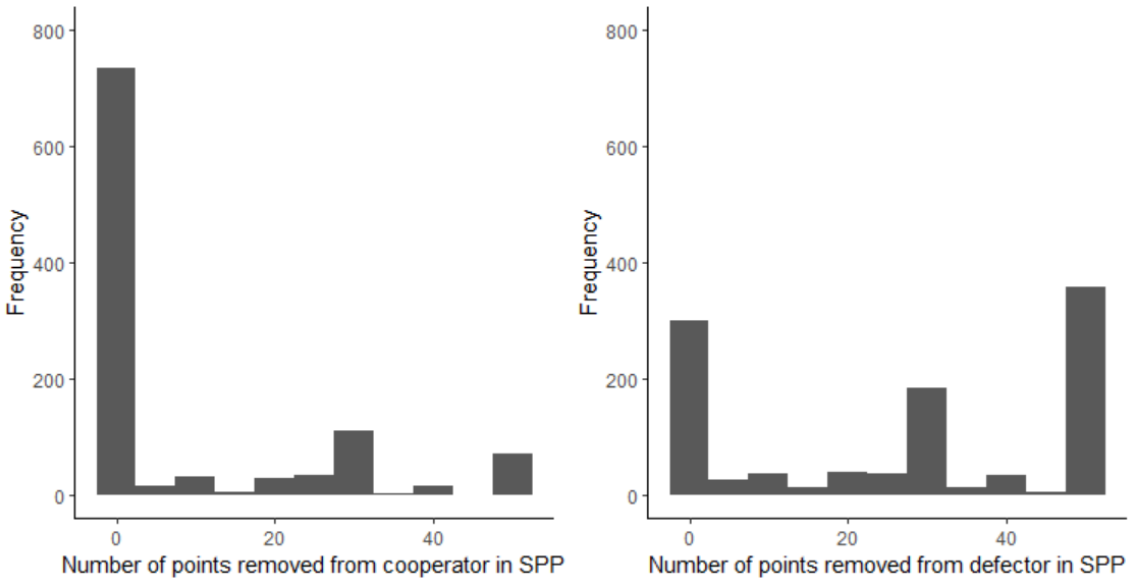


Figure 15. Number of points removed in the Second-Party Punishment Game in Wave 1.

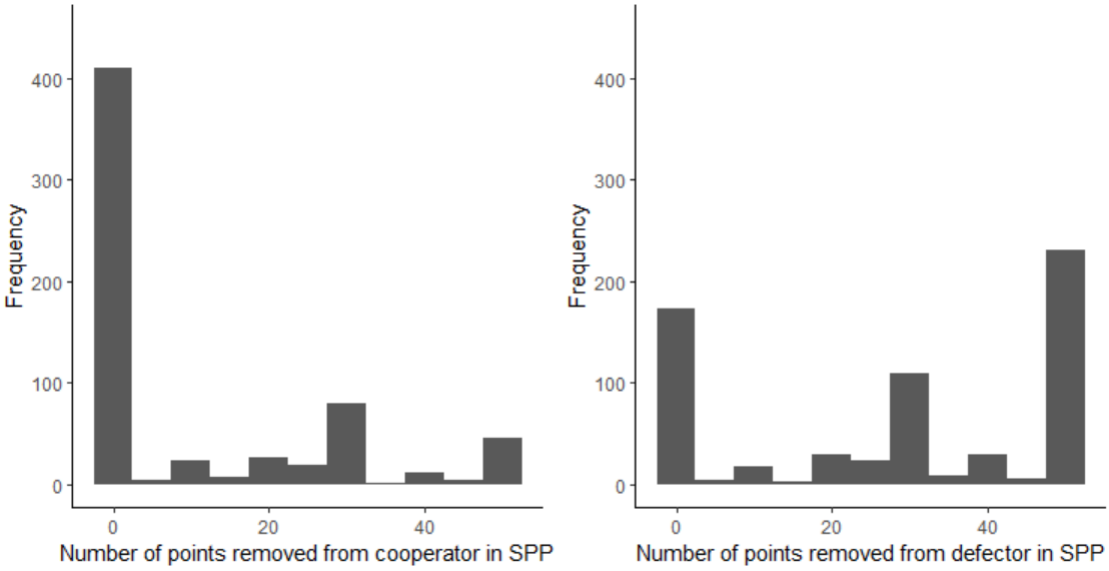


Figure 16. Number of points removed in the Second-Party Punishment Game in Wave 2.

4.8 Stag-Hunt with Punishment Game

The Stag-Hunt with Punishment Game is a measure of coordination and altruistic punishment. This game was adapted from the Second-Party Punishment Game by our research team, changing the payoff matrix for the transfer phase to create a coordination problem rather than a social dilemma. This game creates three variables: the decision to coordinate or defect in a Stag Hunt, punishment of coordinators, and punishment of defectors. This third variable (punishment of defectors) loads onto the "punishment" latent variable. We only used this game in Wave 1 (egame.SHP1.T10 / egame.SHP2.T10 / egame.SHP3.T10).

On the first page, participants read the following instructions:

In this task you are matched with one other person.

One of you will be Person A, one of you will be Person B.

Both individuals start with 100 points.

This task has two phases. In each phase, both people choose at the same time.

The transfer phase

In the transfer phase, both people will choose whether to transfer 30 of their points to a group project or not. The group project is only successful if both people transfer points to it, in which case the 60 points in it will be doubled to 120 and distributed evenly between both people. If only one person transfers, the group project is not successful, and the points in it are lost.

The penalty phase

In the penalty phase, each person then chooses whether they want to remove up to 50 points from the other person, based on the other person's decision in the transfer phase. For every 5 points someone wants to remove from the other person, they must pay 1 point.

NOTE: Removed points are completely removed from the task, they are not 'taken' by you.

On the next page, participants answer the following comprehension question (correct answer is C):

If you transfer 30 points to the group project, but the other person does not, how many points will you have at the end of the transfer phase?

(A) 130 points (100 start + 30)
(B) 100 points (100 start + 0)
(C) 70 points (100 start - 30)

On the next page, participants make their transfer phase decision:

Will you transfer 30 points to the group project?

- *Transfer 30 points*
- *Don't transfer*

On the final page, participants make their penalty phase decisions:

Depending on the other person's decision in the transfer phase, how many points would you like to remove from them?

If the other DOES TRANSFER, I will remove this many points... [0 - 50]

If the other DOESN'T TRANSFER, I will remove this many points... [0 - 50]

In Wave 1, 1,001 / 1,045 participants (96%) chose to coordinate in the transfer phase. Participants removed an average of 6 points from coordinators (SD = 14 points, range = 0 – 50 points) and removed an average of 25 points from defectors (SD = 19 points, range = 0 – 50 points; Figure 17).

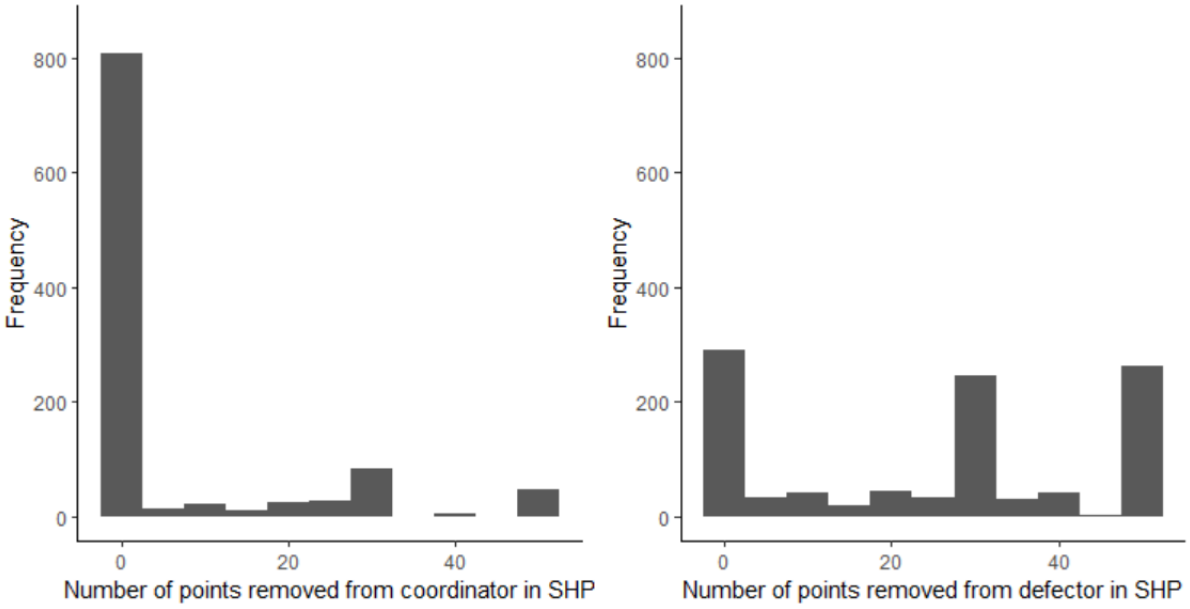


Figure 17. Number of points removed in the Stag-Hunt with Punishment Game in Wave 1.

4.9 Rule Following Task

The Rule Following Task is a measure of rule following and norm adherence. This task was adapted from the protocol in Kimbrough & Vostroknutov (2018). This task creates 31 variables: 30 sequential binary decisions (egame.RFTXX.T11), and a final variable capturing the sum of all these decisions (egame.RFT_Sum.T11). We only used this task in Wave 2. The task implemented counterbalancing, such that the rule following bucket was randomly allocated to be either Bucket A or Bucket B.

On the first page, participants read the following instructions:

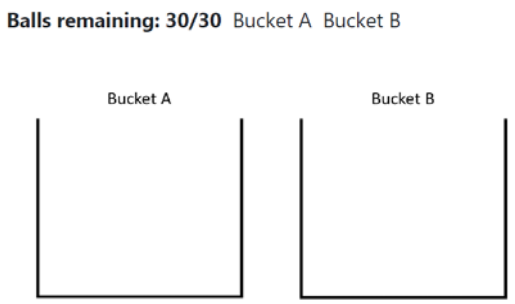
> *In this solo task, you will decide how to allocate 30 balls between two buckets.*
>
> *Your task is to put each of the balls, one-by-one, into the two buckets on the screen.*
>
> *You will allocate each ball by clicking either the button for Bucket A or the button for Bucket B.*
>
> *For each ball you put in Bucket A you will receive 2 points, and for each ball you put in Bucket B you will receive 1 points.*
>
> *The rule is to put the balls in Bucket B.*

On the next page, participants answer the following comprehension question (correct answer is A):

> *How many points will you receive for each ball you put in Bucket A?*
>
> *(A) 2 points*
> *(B) 1 points*

On subsequent pages, participants make 30 sequential binary rule-following decisions:

> *Remember, for each ball you put in Bucket A you will receive 2 points, and for each ball you put in Bucket B you will receive 1 point.*
>
> *The rule is to put the balls in Bucket B.*
>
> *Please now allocate the balls to the buckets you choose using the buttons below. You must allocate all the balls to continue.*



In Wave 2, 263 / 636 participants (41%) never broke the rule, 78 / 636 participants (12%) always broke the rule, while other participants fell somewhere in between (Figure 18).

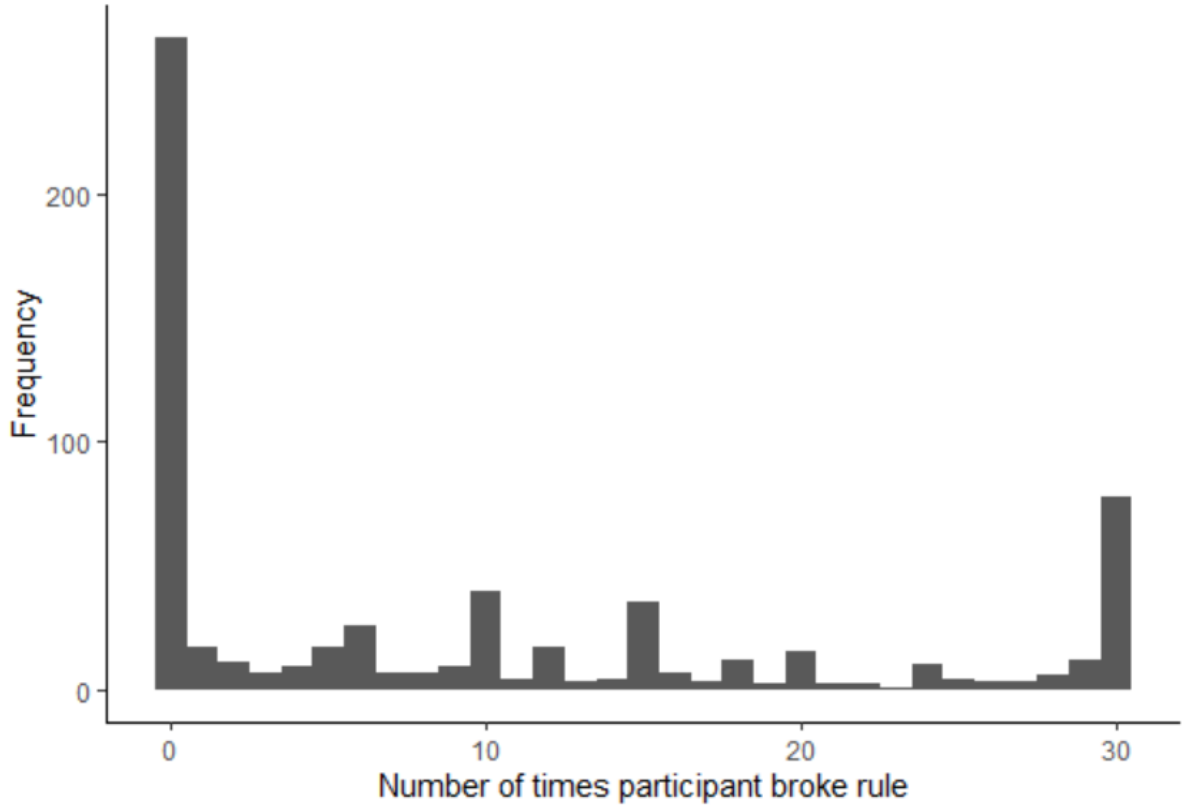


Figure 18. Number of times participants broke the rule in the Rule Following Task in Wave 2.

4.10 BEAST

The BEAST (Berlin Estimate AdjuStment Task) is a measure of conformity and social information use. This task was adapted from the protocol in Molleman, Kurvers, & van den Bos (2019). We only used this task in Wave 2. The task consists of five rounds, and each round creates three variables: a first estimate (egame.BEAST_RXE1.T11), the social information (egame.BEAST_RXPE.T11), and a second estimate (egame.BEAST_RXE2.T11). Together, these variables are combined to calculate the final BEAST score for that round (egame.BEASTRXscore.T11; calculation explained below).

On the first page, participants read the following instructions:

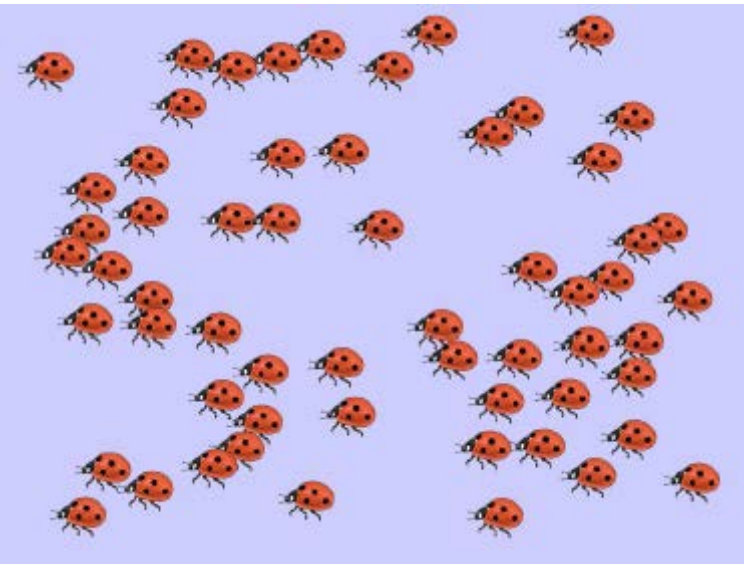
> *In this task, you have to make a number of estimates. The number of points you earn in this task depends on how accurate your estimates are.*
>
> *The task consists of 5 rounds. At the beginning of each round, you will observe an image showing a number of animals. The image will disappear after 6 seconds. Once the image has disappeared, you have to enter an estimate of how many animals were displayed within 15 seconds. The more accurate your estimate, the more points you can earn. This is your estimate for Part A of a round.*
>
> *Once you have entered your estimate, Part B of the round begins. You can observe the estimate of another participant. Over 100 people participated in a previous session in which they completed this task. In each round, you can observe the Part A estimate of one of these previous participants. Previous participants saw the same image as you. They also saw it for six seconds. After the image disappeared, they also had to estimate how many animals were displayed. They could also earn more points if their estimate was more accurate.*
>
> *You then have to enter a second estimate within 45 seconds. You can enter the same estimate as before, or adjust it as you wish. This is your estimate for Part B of a round. Once you have entered your Part B estimate, the round is over and a new round begins.*
>
> *Note: if you do not enter your estimate within the time limit, you will earn 0 points for this task.*
>
> *To calculate your earnings, the computer will randomly select 1 of the 5 rounds of this task. Then, the computer will randomly select Part A or B. Your estimate for that part is used to calculate your earnings for this task. If you estimated the number of animals exactly right, you earn 100 points. For each number that you are off, we subtract 5 points. Your earnings cannot become negative. For example, if the actual number of animals in the image was 60, and you estimate 53, you were 7 off. We subtract 7 x 5 = 35 points, so you would earn 100 - 35 = 65 points.*

On the next page, participants answer the following comprehension question (correct answer is A):

> *Once you have entered your estimate, you can observe the estimate of a previous participant who completed this task before, and then make a second estimate.*

(A) True
(B) False

On the subsequent pages, participants complete the five rounds of the BEAST task. In an example round, they are first shown an image with a number of animals on them for six seconds, like this:



On the next page, they are then asked to provide their first estimate (E_1):

How many [animals] were shown in the image?

On the next page, they are shown social information (s) and asked to provide their second estimate (E_2):

Your Part A estimate of [first estimate] has been recorded.

Now, we show you the Part A estimate of a participant who has completed this task before. This previous participant saw the same image that you just did. They also saw it for 6 seconds. Their estimate was [social information]. You can now enter your Part B estimate below.

How many [animals] were shown in the image?

This then repeats for four more rounds, with different numbers of different animals in each round.

Social information (s) is determined by searching a real database of estimates from 100 previous participants sampled by Molleman, Kurvers, & van den Bos (2019) in their original paper. The computer searches for an estimate in this database that is (1) in the direction of the true (correct) answer (*e.g.* if participant guesses 50 and true answer is 60, social information will be higher than 50) and (2) deviates from the participant's first estimate according to a parameter Δ: $s = E_1 * (1 \pm \Delta)$. Replicating the original paper, this Δ parameter varied across the five rounds, taking values of 0.25, 0.15, 0.20, 0.15, and 0.25 respectively.

Based on participants' two estimates and the social information they were provided, we calculate a BEAST score for that round using the following equation:

$$\text{BEAST score} = \frac{E_2 - E_1}{s - E_1}$$

We remove cases where (1) participants moved their second estimate *away* from the social information, (2) where participants moved their second estimate *further than* the social information, or (3) participants ran out of time to make their estimate. The BEAST score varies between 0 and 1, where 0 implies that the participant did not shift their estimate after receiving social information and 1 implies that the participant shifted their estimate completely towards the social information.

Plotting the distribution of BEAST scores (averaged over all five rounds) reveals that participants are generally biased towards sticking with their first estimate, though there is substantial variation (Figure 19).

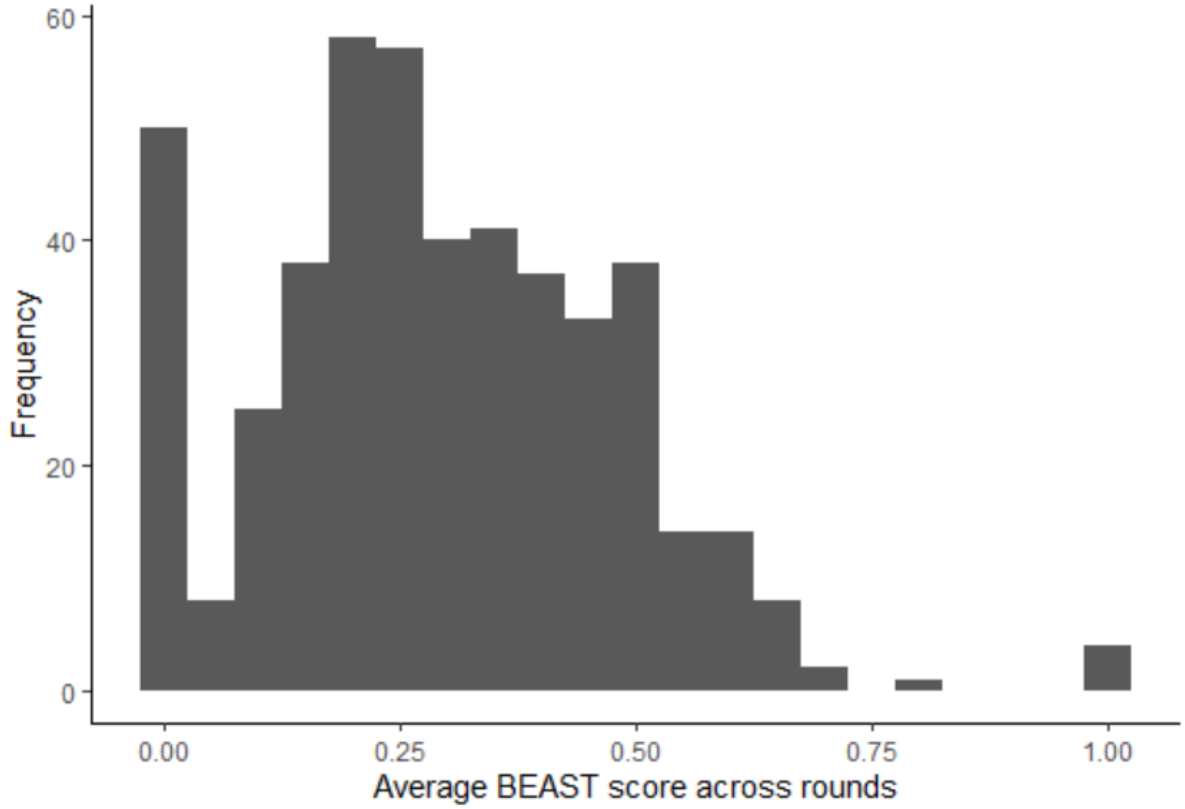


Figure 19. Average BEAST score across all five rounds in Wave 2.

5 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.

Kimbrough, E. O., & Vostroknutov, A. (2018). A portable method of eliciting respect for social norms. *Economics Letters*, *168*, 147-150.

Molleman, L., Kurvers, R. H., & van den Bos, W. (2019). Unleashing the BEAST: a brief measure of human social information use. *Evolution and Human Behavior*, *40*(5), 492-499.

Peysakhovich, A., Nowak, M. A., & Rand, D. G. (2014). Humans display a 'cooperative phenotype' that is domain general and temporally stable. *Nature communications*, *5*(1), 1-8.