Supplementary Information for:

Human cooperation by lethal group competition

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This section contains the English translation of the Dutch instructions used in the "together alone" game.

Introduction

Welcome to this experiment on decision making.
In this experiment, everyone earns 10 euro for participating. The experiment consists of three parts, and in every part you can earn another 30 euro.

This experiment is organised by the Institute for Biodiversity and Ecosystem Dynamica (IBED) of the Faculty of Science in collaboration with the Center for Research in Experimental Economics and political Decision-making (CREED) of the Faculty of Economics and Econometrics, University of Amsterdam. This experiment serves scientific purposes exclusively.

What can you expect in the next 1.5 hours?

1. An explanation of the experiment. Please read this carefully, it is of great importance to the research that you understand what is going to happen.
2. Exercise questions. When you answer these correctly, the scientists know that you understand the experiment well.
3. The experiment itself.
4. Everyone will be paid when the experiment is finished. The participants will be called one by one to the reception room where payment will proceed in anonymity.

Instructions for the experiment

The experiment will be carried out in 3 parts with groups of 12 participants. At the start of each part, the participants will be distributed anonymously over 4 groups of 3 participants. This means that you do not know which other participants are in your group. After each part is finished, all the participants will again be distributed in such a way that in each part of the experiment you will be in a group with different participants.

At the start of each part everyone owns a capital of 100 points. The group total is determined by the sum of the points of the individual group members. At the start of each part, the group total is therefore 300 points (i.e., 3 participants × 100 points).

Every part is executed over a number of rounds. Every round consists of two phases: the investment phase and the result phase. In the **investment** phase every group member can decide to invest points into the group. His investment will be multiplied with 1.5 and distributed over the other two group members. Hence, the investing participant does not get any return from his own investment. The group total will rise by investments of the group members in the investment phase. During the investment phase it is not known to any participant how much the other group members invest.

In the **result** phase you will get to know how much your group members invested. Based on the number of points invested by you and your group members, your new capital of points is calculated. This capital of points is yours to use in the next round and will count for the group total.
In the result phase you also get to see the group totals of the other groups.

Every part will consist of an unknown number of rounds. After a certain number of these rounds, the group with the lowest group total will be eliminated. The moment of elimination is not known beforehand; hence, this could be after 1 round but it could also be after 5 rounds. After the first elimination of a group, the remaining 3 groups will continue the experiment. The members of the groups that remain keep their capital of points. Again, after a certain number of rounds the group with the lowest group total will be eliminated, after which the experiment continues with the remaining 2 groups. Again after an unknown number of rounds the third group will be eliminated. Now there is only one group left. Only the participant with the highest number of points in this group will receive 30 euro.

With this, this part of the experiment is concluded, and all participants are again distributed in groups of 3 for the next, identically executed, part of the experiment until all three parts of the experiment are executed.

If groups happen to have equal group totals during an elimination event, the computer will randomly decide which group is eliminated. Also, if participants in the last remaining group have equally high numbers of points, the computer will randomly decide which of them will receive the payment of 30 euro.

Below we explain all stages of the experiment in more detail.

The investment phase

At the start of each part of the experiment all participants receive a capital of **100 points**. You have to decide in every round how much of your capital of points you want to invest and how many points you want to keep for yourself. The other 2 group members have to take the same decision **at the same time**. The points you keep for yourself will be yours to use in the next round, and this number of points will be raised depending on investments of your group members. Therefore, in the next round you may have more or less than 100 points, depending on your own decision and the decisions of your 2 group members. In any round you cannot invest more than your capital of points, and your investment must be an integer number of points. If you decide to invest nothing, you fill in "0" in the appropriate field on your computer monitor.

The result phase

Each investment will be **raised** by the experimenters **with 50%** and divided over the 2 other members of your group. Both group members therefore receive 75% of your investment (i.e., 1.5 times your investment divided over 2 group members). You get **nothing** from your investment. Your capital of points can only be raised by the investments of the other 2 group members.

Hence your capital of points at the end of a round is the sum of:
1. The number of points you have not invested (capital of points – own investment)
2. Income from the investment of group member A ($0.75 \times$ investment A)
3. Income from the investment of group member B ($0.75 \times$ investment B)

The capital of points is calculated for each group member in exactly the same way.

Calculation examples

To clarify the calculations, we here give you a couple of examples of situations that may occur during the experiment.

Example 1:

You and your fellow group members invest **nothing**. This is the first round and the starting capital of points is therefore 100 points. Each group member thereby keeps his or her 100 points and does not receive any points from investments of others.

Your capital of points after this round:
Start capital – investment =	$100 - 0 =$	100
0.75 x investment A =	$0.75 \times 0 =$	0
0.75 x investment B =	$0.75 \times 0 =$	0 +
New capital of points		100

Capital of points of group member A after this round:
Start capital – investment =	$100 - 0 =$	100
0.75 x your investment =	$0.75 \times 0 =$	0
0.75 x investment B =	$0.75 \times 0 =$	0 +
New capital of points		100

Capital of points of group member B after this round:
Start capital – investment =	$100 - 0 =$	100
0.75 x investment A =	$0.75 \times 0 =$	0
0.75 x your investment =	$0.75 \times 0 =$	0 +
New capital of points		100

The **group total has remained the same**, because the capitals of the group members has remained the same.

Example 2:

This is the round after that of the previous example; hence, all group members still have 100 points. For simplicity we assume that no group has been eliminated yet, so your group still participates in the experiment. This round all group members invest **all of their points**. Below are again the calculations for the new capitals of points for the group members.

Your capital of points after this round:
Start capital – investment =	100 – 100 =	0	
0.75 x investment A =	0.75 × 100 =	75	
0.75 x investment B =	0.75 × 100 =	75	+
New capital of points		150	

Capital of points of group member A after this round:
Start capital – investment =	100 – 100 =	0	
0.75 x your investment =	0.75 × 100 =	75	
0.75 x investment B =	0.75 × 100 =	75	+
New capital of points		150	

Capital of points of group member B after this round:
Start capital – investment =	100 – 100 =	0	
0.75 x investment A =	0.75 × 100 =	75	
0.75 x your investment =	0.75 × 100 =	75	+
New capital of points		150	

The group total now is 450 points, an **increase of 150 points** compared to the previous round (300 points).

Example 3:

We now find ourselves in round 3, again following the round of the previous example. For simplicity we again assume that no group has been eliminated yet, your groups still participates, and you have a capital of 150 points (your capital accumulated over the previous two rounds). Your investment in this round is **40 points**, the investment of group member A is **24 points** and that of group member B is **12 points**. Below are again the calculations for the new capitals of points for the group members.

Your capital of points after this round:

Start capital – investment =	150 – 40 =	110	
0.75 x investment A =	0.75 × 24 =	18	
0.75 x investment B =	0.75 × 12 =	9	+
New capital of points		137	

Capital of points of group member A after this round:

Start capital – investment =	150 – 24 =	126	
0.75 x your investment =	0.75 × 40 =	30	
0.75 x investment B =	0.75 × 12 =	9	+
New capital of points		165	

Capital of points of group member B after this round:

Start capital – investment =	150 – 12 =	138	
0.75 x investment A =	0.75 × 24 =	18	
0.75 x your investment =	0.75 × 40 =	30	+
New capital of points		186	

The group total is now 488 points, an **increase of 38 points** compared with the previous round (450 points).

Example 4:

We now find ourselves in round 4, again following the round of the previous example. For simplicity we again assume that no group has been eliminated yet, your groups still participates, and you have a capital of 137 points (your capital accumulated over the previous three rounds). Your investment in this round is **0 points**, the investment of group member A is **60 points** and that of group member B is **60 points**. Below are again the calculations for the new capitals of points for the group members.

Your capital of points after this round:

Start capital – investment =	$137 - 0 =$	137
0.75 x investment A =	$0.75 \times 60 =$	45
0.75 x investment B =	$0.75 \times 60 =$	45 +
New capital of points		227

Capital of points of group member A after this round:

Start capital – investment =	$165 - 60 =$	105
0.75 x your investment =	$0.75 \times 0 =$	0
0.75 x investment B =	$0.75 \times 60 =$	45 +
New capital of points		150

Capital of points of group member B after this round:

Start capital – investment =	$186 - 60 =$	126
0.75 x investment A =	$0.75 \times 60 =$	45
0.75 x your investment =	$0.75 \times 0 =$	0 +
New capital of points		171

The group total is now 548 points, an **increase of 60 points** compared to the previous round (488 points).

This concludes the examples of calculations of the capitals of points and group totals. If you have any question or if something is unclear, please raise your hand. One of the experimenters will come to you and answer your questions.

Elimination of groups

At the end of a round unknown to all participants the computer eliminates one of the groups. This can happen in any round. At the end of such a round you will be informed that a group has been eliminated. This may be your own group or one of the other groups. It is possible that in one round no group is eliminated and in the next round a group is. It is also possible that for a number of rounds no group is eliminated. At the end of a round where a group is eliminated, the group with **the lowest group total** will be eliminated. In case more than one group have the same, lowest group total, the computer will randomly eliminate one of them. We will again present a number of examples to clarify the elimination system.

Example 1:

At a certain moment there are still 4 groups, i.e. no group has been eliminated yet. This is not an elimination event, so **no group** will be eliminated at the end of this round. The groups have the following group totals:

Your group: 360
Other group: 420
Other group: 300
Other group: 450

The group with 300 points will not be eliminated, even though this group has the lowest group total. In the next round, therefore, all the groups will still participate.

Example 2:

At a certain moment there are still 4 groups, i.e. no group has been eliminated yet. This is an elimination event, so **one group** will be eliminated at the end of this round. The groups have the following group totals:

Your group: 430
Other group: 340
Other group: 310
Other group: 450

The group with 310 points has the **lowest group total**, and will be eliminated. In the next round, your group and the other two groups will proceed with the next round in this part of the experiment.

Example 3:

At a certain moment there are 3 groups left, i.e. 1 group has been eliminated in the previous round(s). This is an elimination event, so **one group** will be eliminated at the end of this round. The groups have the following group totals:

Your group: 425
Other group: 345
Other group: 345

The two other groups have the same, **lowest** group total, and the computer will now **randomly** eliminate one of these two groups. Your group and the other remaining group will proceed with the next round in this part of the experiment.

This concludes the examples on the elimination system. If you have any question or if something is unclear, please raise your hand. One of the experimenters will come to you and answer your questions.

When only one group is left

After three elimination events, only one group is left. There will **not** be any more investment rounds after that. When the third group has been eliminated, immediately the group member with the **highest** capital of points will be determined in the single remaining group. This participant will receive 30 euro. If there are more than one group member with the highest capital of points, the computer will choose one of them **randomly** as the one to receive 30 euro. Hence, the 30 euro will never be shared. We again present a couple of examples.

Example 1:

Your group remained after the third group was eliminated. The capitals of points of the group members is as follows:

Your score: 460
Group member A: 460
Group member B: 470

Group member B has the **highest** capital of points and receives 30 euro.

Example 2:

Your group again remained after the third group was eliminated. The capitals of points of the group members is as follows:

Your score: 490
Group member A: 465
Group member B: 490

Both you and group member B have the highest capital of points. The computer will now **randomly** decide which of you two receives the 30 euro.

This concludes the examples on determining the participant that receives the monetary payoff. If you have any question or if something is unclear, please raise your hand. One of the experimenters will come to you and answer your questions.

The experiment consists of 3 parts

After conclusion of part 1 and part 2 of the experiment, all participants are again distributed over 4 groups of 3, in such a way that you share a group with different participants in each of the parts. If your group is eliminated in part 1, for example, you do participate again in parts 2 and 3. All participants start a new part with a capital of 100 points.

After part 3 is finished, all participants will be paid one by one in the reception room.