Faculty of Business and Law

Working Papers in Economics & Finance
2022-01

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Ego-relevance in team production *

César Mantilla[†] Zahra Murad [‡,§]

January 30, 2022

Abstract

We study how individuals' contribution to a team production task varies depending on whether the task is ego relevant or not. We design and conduct an experiment to test the effect of ego-relevance when the team output depends on the top- and the bottom-performer of the group. Ego-relevance is manipulated by calling the Raven IQ Test an "IQ Task" or a "Pattern Task". We find that the contribution, which corresponds to an allocation of intended effort in the task, is affected by ego-relevance and the nature of the team production. However, both effects are mediated by the expected teammate's contribution. Ego-relevance increases the responsiveness to the expected teammate's behavior, a behavior that is also more noticeable when the team output depends on the bottom-performer. Nevertheless, we do not observe crossed-effects between ego-relevance and the nature of team production.

Keywords: ego-relevance; experiment; team contribution; team production

JEL Classification Codes: C90, D91
PsycINFO Classification code: 2360, 3660

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*Declarations of interest: None. The data and scripts can be accessed through the doi: `10.17632/7mfdv9dr2x.1`

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1 Introduction

Team production environments are generally prone to free-riding and shirking among teammates (Alchian and Demsetz, 1972; Büyükboyacı and Robbett, 2017). However, the literature is silent on how this may depend on the ego-relevance of tasks in a team project. A familiar example is preparing a co-authored academic project. One could easily distinguish between tasks that would affect one's ego depending on success or failure, such as writing a mathematical proof or programming a statistical test; and tasks whose completion would not have any effect on academics' ego, such as producing a project's expense report.

The standard economic theory makes no distinctions concerning the ego-relevance of the team production task that individuals are required to undertake. Motivational theories of behavioural economics predict that ego-relevance will stimulate the willingness to contribute with a costly effort by raising individuals' self-confidence and intrinsic motivation (Bénabou and Tirole, 2002, 2003; Köszegi, 2006). On the other hand, psychological theories predict that ego-relevance will demote the willingness to contribute because of ego-protection: individuals in fear of failing the task might reduce their effort (Thompson et al., 1995; Tice, 1991).

Although higher confidence about one's abilities is related to more self-interested status-seeking behaviour (Tsai and Xie, 2017), it is not clear whether this pattern is robust to the nature of team production. For instance, if the team production function greatly depends on the team's best or worst performer, it is not clear whether the team output might be enhanced by ego-motivation or suppressed by ego-protection. Ego-motivation might boost effort by "pulling the team to get the job done", whereas ego-protection may hinder effort by providing a self-justification to shirk (i.e., not wanting to waste effort).

We design an experiment to test the effects of ego-relevance of the task on contribution decisions and its association to the nature of team production. Our experiment employs a 2x2 factorial design. In one dimension, we manipulate the ego-relevance of the task by framing the 10-item Progressive Raven Matrix task either as an "IQ task" (*Ego-Relevant*) or "Pattern task" (*Non-Ego-Relevant*). In the other dimension, we manipulate the nature of the team production: it either depends on the maximum individual contribution, which we call *best-shot* production; or depends on the minimum individual contribution, which we call *complementary* production. Whereas the latter evokes a coordination equilibria, the former evokes an anti-coordination equilibria.

We find that the effects of ego-relevance and the nature of the task on the cooperation–or allocation– decision are mediated by conditional responses to the teammate's expected allocation. The role of beliefs as essential predictors of contribution decisions in social dilemmas is not new (Fischbacher et al., 2001; Mertins and Hoffeld, 2015). However, we show how ego-relevance magnifies the effect of expectations regarding the teammate's allocation. Among the most pessimistic participants (i.e., those reporting a low expected contribution from their teammate), contributions are lower in the *Ego* than in the *Non-Ego* treatment. Nonetheless, the effect of ego-relevance is reverted among the optimistic participants (i.e., those reporting a high expected contribution from their teammate): contributions are higher in the *Ego* than in the *Non-Ego* treatment.

Our results speak to two strands of the literature. First, to the study of how ego-relevance affects economic decisions. This strand of literature has focused on how the ego-relevance induced by a task, or by a decision-making context, affects belief updating and information processing. For instance, wishful thinking might be simultaneously driven by ego-related motives and non-ego related motives such as optimism (Heger and Papageorge, 2018). The conclusions from studies involving feedback are somewhat mixed. People tend to either ignore positive (Coutts, 2019; Ertac, 2011) and negative information (Eil and Rao, 2011; Mobius et al., 2014), and there is also evidence of a mixed asymmetry when incorporating positive or negative information into updating their ego-relevant traits (Buser et al., 2018; Grossman and Owens, 2012). We test whether the ego-relevance of a context affects individual decisions in a strategic setup. Our findings point out to a connection between ego-relevance and the conditional allocation of resources in a joint task. This evidence is important in the light of theoretical models connecting principal-agent relationships with self-esteem and the reaction to ego-threats (Sebald and Walzl, 2015).

Second, we contribute to the literature exploring how the nature of team production task affects performance. Although sports data serve as a laboratory for testing how individuals contribute to their teams (Szymanski, 2003; Franck and Nüesch, 2010; Chapsal and Vilain, 2019), specific mechanisms can be more easily explored using controlled experiments. For instance, in understanding how the sorting of heterogeneous agents into teams affects effort (Brookins et al., 2015, 2018; Büyükboyacı and Robbett, 2017). In an experiment introducing incentives closer to our paper, Sheremeta (2011) shows that effort expenditures are very different, even if group composition is similar, when the team output is modeled as best-shot or as a weak-link production. Whereas the former production model induces free-riding among the weak players within the group, in the latter all the participants expend similar effort levels. In our study, although the team production function is also implemented either as a best-shot or weak-link (i.e., complementary efforts), we find much smaller differences in the participants' behavior.

2 Model

A team consisting on two subjects, i and j, must undertake a task whose payoff depends on a team score S_{ij}. Each scored unit yields a benefit b, identical to both subjects. Subjects cannot directly decide how much they will contribute to the team score. Instead, they allocate effort units $A_k \forall k \in \{i, j\}$, that will be converted into an individual score that depends on the subject's ability to convert effort into the actual output. Each individually allocated unit has a cost c. The payoffs function is depicted in equation 1, where e represents the endowment.

$$\pi_k = e - cA_k + bS_{ij} \qquad \forall k \in \{i, j\} \tag{1}$$

We now explain how the allocated units A_k are transformed into k's contribution to S_{ij}, defined by the individual score $S_k \forall k \in \{i, j\}$. Imagine that the task is formed of multiple, identical, subtasks. Each unit in A_k gives the chance of solving one of these subtasks. Let us define ω_k^τ as the probability that subject $k \in \{i, j\}$ successfully solves subtask τ. If the task is correctly solved, it adds one point to the individual score S_k. This individual score can thus be defined as the sum of the probabilities ω_k^τ across all subtasks $\tau \in T$, where the total set of subtasks T is as large as A_k. We thus have $S_k = \sum^T \omega_k^\tau \forall k \in \{i, j\}$. Nonetheless, as subtasks are identical we can abbreviate this term into $S_k = \omega_k A_k \forall k \in \{i, j\}$.

The third element of the model is how individual scores, S_i and S_j are aggregated. We define two different production technologies, mimicking different types of tasks. First, we have *best-shot* production, where $S_{ij} = \max(S_i, S_j)$. This technology is useful for representing joint tasks where team output is better represented by the largest individual contribution, aligned with the idea of the effect of "superstars" (Rosen, 1981). This might be the case of creative industries, where one of the teammates' ideas is implemented by the entire team. Second, we have *complementary* production, where $S_{ij} = \min(S_i, S_j)$. This technology represents joint tasks depending on the output of the weakest link. It is also called the "O-ring" production, referring to the importance that every piece–or member–has in the final output, in an analogy to the malfunction of O-rings that lead to the failure of the Challenger shuttle (Kremer, 1993). We will explore now the predictions for each production technology.

2.1 Best-shot production

The payoff function has the form:

$$\pi_k = e - cA_k + b \cdot \max(\omega_i A_i, \omega_j A_j) \qquad \forall k \in \{i, j\}$$

For simplicity, imagine that the task has a single subtask, and A_k becomes binary. The allocation decision depends on the absolute and the relative ability to solve the task. A player k is willing to solve the subtask if her ability is greater than the cost-benefit relationship, or $\omega_k > c/b$.

Nonetheless, the decision depends as well on i's relative ability with respect to j, or $\Delta\omega = \omega_i - \omega_j$. Player i will choose $A_i = 1$, regardless of j's choice, only if her relative ability is sufficiently large, or $\Delta\omega > c/b$. Otherwise, if the ability of i and j are similar, the equilibria is inherited from an "anti-coordination" game: if i expects $A_j = 1$ she will choose $A_i = 0$, and *vice versa*. The full procedure is reported in Appendix B.

The same intuition holds with multiple subtasks. Provided that both subjects' abilities exceed the threshold c/b, the anti-coordination equilibria will predict that subjects will choose extreme allocations: either very large when expecting a teammate's low allocation; or very small when expecting a teammate's high allocation.

2.2 Complementary production

The payoff function has the form:

$$\pi_k = e - cA_k + b \cdot \min(\omega_i A_i, \omega_j A_j) \qquad \forall k \in \{i, j\}$$

We explore the simplified version including a single subtask. The binary allocation decision A_k depends again on the comparison between ω_k and c/b. However, subject k now selects $A_k = 1$ if the lowest ability among the two team members exceeds the cost-benefit threshold, or $\min(\omega_i, \omega_j) > c/b$. Otherwise, both subjects select $A_k = 0$. The full procedure is also reported in Appendix B.

Contrary to the best-shot production, the nature of the equilibria emulates a coordination game: due to the weakest-link structure in the payoffs, the aim of subject k is to mimic the allocation decision of her teammate. If their ability surpasses the threshold imposed by c/b, both subjects aim at solving the subtask. Otherwise, none of them will solve it.

Extending this intuition to the general setting with multiple subtasks one can think on the resemblance of this structure with the minimum-effort game, as in Van Huyck et al. (1990). Provided that the ability of both teammates is the same–and it is sufficiently large– (i.e., $\omega_i = \omega_j > c/b$), every symmetric allocation decision is an equilibrium. To the extent that abilities differ, some of the symmetric allocations are no longer equilibria.

2.3 Ego-motivation and ego-protection

We introduce the notions of ego-motivation and ego-protection into the model described above. We require three assumptions to do so. First, we assume that ego-motivation emerges with high ability levels in a given task, whereas ego-protection emerges with low ability levels in the same task. Second, we assume that ego-motivation increases the benefit derived from the team score S_{ij}, whereas ego-protection increases the costs from each allocated unit in A_k. Third, we assume that individual contributions to the team score cannot be perfectly observed. This is plausible given the nature of team production with unobservable individual efforts, and it gives more room for ego-motives to operate (i.e., subjects cannot validate whether they are effectively contributing more or less than their teammate).

The augmented model, including these assumptions to include ego-relevance, goes as follows:

$$\pi_k = \begin{cases} e - cA_k + (b+\mu) \cdot g(\omega_i A_i, \omega_j A_j) & \text{if } \omega_k \geq \tilde{\omega} \\ e - (c+\phi)A_k + b \cdot g(\omega_i A_i, \omega_j A_j) & \text{if } \omega_k < \tilde{\omega}, \end{cases} \tag{2}$$

where μ is the non-material benefit derived from ego-motivation when subject k's ability, ω_k, is above a threshold $\tilde{\omega}$; and ϕ is the non-material cost associated with ego-protection when $\omega_k < \tilde{\omega}$. Moreover, $g(\cdot)$ captures the team production function, either best-shot or complementary. Note that μ increases the marginal benefit of each additional unit scored by the team, and ϕ increases the marginal cost of each unit allocated in A_k. Therefore, we can write $\tilde{b} = b + \mu$ as the augmented marginal benefit, accounting for the benefits of ego-motivation; and $\tilde{c} = c + \phi$ as the augmented marginal cost, accounting for the costs of ego-protection.

For the predictions described in Subsections 2.1 and 2.2, the ability ω_k is compared to the threshold c/b to decide allocation. In the presence of ego-motivation, the reasoning is similar but the threshold is now affected by the augmented marginal benefit and cost, $\tilde{b}$ and $\tilde{c}$. When ego-motivation is at play, the minimum ability guaranteeing a positive allocation A_k is easier to reach, because the threshold $c/\tilde{b}$ is lower than c/b. For best-shot production, an additional implication is that the values of $\Delta\omega$ leading to the anti-coordination equilibria shrink ($\Delta\omega$ is now compared with $c/\tilde{b}$), increasing allocation. We predict the opposite behavior when ego-protection is at play. The minimum ability yielding $A_k > 0$ increases, as ω_k is now compared to $\tilde{c}/b$, a greater value than c/b.

In Equation 2 we implicitly assume that the benefits of ego-motivation, captured through μ, are symmetric for both teammates. This is the reason we can put μ outside the production function. However, we can consider other scenarios. Take for instance the case where subject i cares about ego-motivation and she assumes that j does not. The benefit from the team score will be $bg(\mu\omega_i A_i, \omega_j A_j)$, with $\mu > 1$. With the best-shot production function, the *max* argument causes that ego-motivation increases the allocation because it increases $\Delta\omega$. By contrast, with complementary production, the *min* argument causes that a smaller own allocation, multiplied by $\mu > 1$, her teammate's expected allocation.

However, the opposite predictions may arise if a participant is aware of the ego-relevance of the task, but she knows that her teammate is more affected by this non-pecuniary motivation. We stick to the model assuming symmetry of ego-relevance for interpretation purposes–because our experiment does not let us identify the strategic effects of asymmetric ego-relevance–, though it leaves an open door for an *ex post* analysis of an ampler role for ego-relevance.

3 Experimental Setup

In this Section, we present our experimental paradigm and explain how it is connected with the model described in Section 2. We then proceed to list our predictions and describe the data collection procedure.

3.1 Experimental paradigm

Our experimental paradigm consists of two parts, described below, plus a final questionnaire. See the Online Supplementary Materials for the full instructions.

Part 1

Participants were asked to complete a 10 Raven Progressive Matrices test within two minutes (Raven and Raven, 2003). We announced that this test was not directly incentivized, but their performance would affect the quality of their teammate in Part 2 (i.e., they knew that the more matrices they correctly solved, the better their future teammate). We did not provide any other information about Part 2 during Part 1. Thus, we eliminated any possibility of hedging or intentional under-performance related to the teammate matching.

After completing Part 1, we elicited the participants' confidence of their performance. As a measure of *absolute* confidence, we ask for the participants' beliefs about their own score. We incentivized this belief by paying participants an additional £0.10 if their answer was correct. To measure *relative* confidence, we ask for the participants' beliefs about their score being in the top half and top quarter of the distribution. Relative confidence measures were not incentivized.

Part 2

Participants were asked to complete another 10 Raven Progressive Matrices test within two minutes, but this time as part of a team production task emulating either the *best-shot* or the *complementary* production function.

For the sorting of teams, participants were ranked from first to twentieth based on their performance in Part 1, and then they were matched in pairs. That is, the first and the second were paired, the third and the fourth were paired, and so on. We informed participants about the matching procedure, but they did not receive any information regarding their position in the ranking.

The payoff function follows Equation 1, with the parameters $e =$£1, $c =$£0.1, and $b =$£0.25. The allocation decision was explained as the number of "activated" questions, from zero to ten, or $A_k \in \{0, 1, \ldots, 9, 10\}$.[1] The allocation–or activation–decision can be thought as an *intended* contribution, since it defines how many matrices, out of ten, will be randomly selected as part of the scoring subset from the participant i. By contrast, the *effective* contribution from participant i will be the number of correctly solved matrices within the scoring subset (S_i). In the computation of S_k, each correctly solved matrix within the scoring subset counted as one additional point. If the time ran out, the unsolved matrices were also eligible to be part of the scoring subset, meaning that their contribution to the score was null.

Note that the subjects' intended contribution involved how many matrices, but not which ones, will enter the scoring subset. Hence, subjects could not hedge between their contribution decision and their performance in the task: as long as a subject paid to contribute with at least one matrix, she had an incentive to correctly complete as many matrices as possible. This feature in our design ensured that subjects had a financially costly contribution decision, yet the subjects' performance in the task acts as a "real" component. This is similar to Gächter et al. (2016), who also advocate for the use of induced effort combined with real effort to measure effort decisions in experiments.

Subjects knew that they would be informed about their final payment, but that they would not receive information either on their individual score or on their teammate's contribution. This ensured sufficient uncertainty to allow the ego-motivation and the ego-protection mechanisms to operate: subjects can successfully self-deceive regarding the random selection of matrices that would be counted in the scoring; and whether it is their own or their teammate's individual score that determines the team score. Subjects had to correctly respond to a control quiz checking their understanding of the instructions and the payoff mechanism. Then, they were allowed to proceed with the contribution decisions.

On the same page where participants make their intended contribution decision, we elicited beliefs regarding their teammate's contribution using a simple incentivized procedure (receiving a bonus of £0.20 if their guess was correct). We then proceeded with the second Raven test.

[1]Other experiments have investigated whether the "realness" of the effort affects contributions in team production. Dutcher et al. (2015) show that contribution to a public good is similar whether the effort is induced, trivial or useful.

Final questionnaire

Subjects had to fill out a questionnaire on demographics, their previous knowledge about Raven Matrices, how close they felt to their teammate by eliciting an Oneness Scale (Gächter et al., 2015), and open-ended questions regarding their thoughts about the experiment.

As a manipulation check for ego-relevance, we also asked whether they would like to pay for being informed about their task scores from Part 1 and Part 2. Each piece of information would cost £0.10, to be subtracted from their final payments.

3.2 Treatment arms

Our experiment employs a 2x2 between-subjects design. We manipulated the effort aggregation in the team production function, and the ego-relevance of the task. As we already explained the former, let us focus on the latter.

We employed a novel ego-relevance manipulation where we kept the task at hand constant, but we changed the framing of the task description. In the *Non-Ego* treatment, the instructions told subjects that they would be shown 10 patterns with a missing element, and their task was to select the option that completes the pattern. In the *Ego* treatment, we raised the ego-relevance of the task by additionally telling subjects that the task was taken from an Intelligence Quotient (IQ) test, and referred them to a published paper that showed a significant relationship between IQ and life outcomes (Bergman et al., 2015). Throughout the experiment, we referred to the task as the "Pattern Task" in the *Non-Ego* treatment and the "IQ task" in the *Ego* treatment.

3.3 Equilibrium predictions and hypotheses

Tables 1 and 2 display the payoff matrices under the best-shot and complementary production, respectively. For this calibration, we set an average ability of 0.8 that is similar to the response rate in the Part 1 of our experiment (i.e., before the joint production task), as reported in Table 3. Thus, we have $\omega_i = \omega_j = 0.8$.

In the best-shot treatment, the predicted equilibria correspond to the anti-coordination outcomes where $\{A_i, A_j\}$ are equal to $\{0, 10\}$ and $\{10, 0\}$ (see the bold cells in Table 1). That is, one teammate activates all her 10 Raven questions, and her teammate's best response is to not activate any question. Under the assumption of symmetric ability, the same equilibria hold as long as $\omega > 0.4$, the ratio between the cost and benefit. If $\omega = 0.4$, any outcome $\{A_i, 0\}$ or $\{0, A_j\}$ is an equilibria. Finally, if the ability falls below the threshold (i.e., $\omega < 0.4$), $\{0, 0\}$ is the unique equilibrium.

	$A_j = 10$	$A_j = 9$	$A_j = 8$	$A_j = 7$	$A_j = 6$	$A_j = 5$	$A_j = 4$	$A_j = 3$	$A_j = 2$	$A_j = 1$	$A_j = 0$
$A_i = 10$	2;2	2;2.1	2;2.2	2;2.3	2;2.4	2;2.5	2;2.6	2;2.7	2;2.8	2;2.9	**2;3**
$A_i = 9$	2.1;2	1.9;1.9	1.9;2	1.9;2.1	1.9;2.2	1.9;2.3	1.9;2.4	1.9;2.5	1.9;2.6	1.9;2.7	1.9;2.8
$A_i = 8$	2.2;2	2;1.9	1.8;1.8	1.8;1.9	1.8;2	1.8;2.1	1.8;2.2	1.8;2.3	1.8;2.4	1.8;2.5	1.8;2.6
$A_i = 7$	2.3;2	2.1;1.9	1.9;1.8	1.7;1.7	1.7;1.8	1.7;1.9	1.7;2	1.7;2.1	1.7;2.2	1.7;2.3	1.7;2.4
$A_i = 6$	2.4;2	2.2;1.9	2;1.8	1.8;1.7	1.6;1.6	1.6;1.7	1.6;1.8	1.6;1.9	1.6;2	1.6;2.1	1.6;2.2
$A_i = 5$	2.5;2	2.3;1.9	2.1;1.8	1.9;1.7	1.7;1.6	1.5;1.5	1.5;1.6	1.5;1.7	1.5;1.8	1.5;1.9	1.5;2
$A_i = 4$	2.6;2	2.4;1.9	2.2;1.8	2;1.7	1.8;1.6	1.6;1.5	1.4;1.4	1.4;1.5	1.4;1.6	1.4;1.7	1.4;1.8
$A_i = 3$	2.7;2	2.5;1.9	2.3;1.8	2.1;1.7	1.9;1.6	1.7;1.5	1.5;1.4	1.3;1.3	1.3;1.4	1.3;1.5	1.3;1.6
$A_i = 2$	2.8;2	2.6;1.9	2.4;1.8	2.2;1.7	2;1.6	1.8;1.5	1.6;1.4	1.4;1.3	1.2;1.2	1.2;1.3	1.2;1.4
$A_i = 1$	2.9;2	2.7;1.9	2.5;1.8	2.3;1.7	2.1;1.6	1.9;1.5	1.7;1.4	1.5;1.3	1.3;1.2	1.1;1.1	1.1;1.2
$A_i = 0$	**3;2**	2.8;1.9	2.6;1.8	2.4;1.7	2.2;1.6	2;1.5	1.8;1.4	1.6;1.3	1.4;1.2	1.2;1.1	1;1

Table 1: Payoff matrix for Best-shot production, with $\omega_i = \omega_j = 0.8$

	$A_j = 10$	$A_j = 9$	$A_j = 8$	$A_j = 7$	$A_j = 6$	$A_j = 5$	$A_j = 4$	$A_j = 3$	$A_j = 2$	$A_j = 1$	$A_j = 0$
$A_i = 10$	**2;2**	1.8;1.9	1.6;1.8	1.4;1.7	1.2;1.6	1;1.5	0.8;1.4	0.6;1.3	0.4;1.2	0.2;1.1	0;1
$A_i = 9$	1.9;1.8	**1.9;1.9**	1.7;1.8	1.5;1.7	1.3;1.6	1.1;1.5	0.9;1.4	0.7;1.3	0.5;1.2	0.3;1.1	0.1;1
$A_i = 8$	1.8;1.6	1.8;1.7	**1.8;1.8**	1.6;1.7	1.4;1.6	1.2;1.5	1;1.4	0.8;1.3	0.6;1.2	0.4;1.1	0.2;1
$A_i = 7$	1.7;1.4	1.7;1.5	1.7;1.6	**1.7;1.7**	1.5;1.6	1.3;1.5	1.1;1.4	0.9;1.3	0.7;1.2	0.5;1.1	0.3;1
$A_i = 6$	1.6;1.2	1.6;1.3	1.6;1.4	1.6;1.5	**1.6;1.6**	1.4;1.5	1.2;1.4	1;1.3	0.8;1.2	0.6;1.1	0.4;1
$A_i = 5$	1.5;1	1.5;1.1	1.5;1.2	1.5;1.3	1.5;1.4	**1.5;1.5**	1.3;1.4	1.1;1.3	0.9;1.2	0.7;1.1	0.5;1
$A_i = 4$	1.4;0.8	1.4;0.9	1.4;1	1.4;1.1	1.4;1.2	1.4;1.3	**1.4;1.4**	1.2;1.3	1;1.2	0.8;1.1	0.6;1
$A_i = 3$	1.3;0.6	1.3;0.7	1.3;0.8	1.3;0.9	1.3;1	1.3;1.1	1.3;1.2	**1.3;1.3**	1.1;1.2	0.9;1.1	0.7;1
$A_i = 2$	1.2;0.4	1.2;0.5	1.2;0.6	1.2;0.7	1.2;0.8	1.2;0.9	1.2;1	1.2;1.1	**1.2;1.2**	1;1.1	0.8;1
$A_i = 1$	1.1;0.2	1.1;0.3	1.1;0.4	1.1;0.5	1.1;0.6	1.1;0.7	1.1;0.8	1.1;0.9	1.1;1	**1.1;1.1**	0.9;1
$A_i = 0$	1;0	1;0.1	1;0.2	1;0.3	1;0.4	1;0.5	1;0.6	1;0.7	1;0.8	1;0.9	**1;1**

Table 2: Payoff matrix for Complementary production, with $\omega_i = \omega_j = 0.8$

In the treatment with complementary production, every symmetric allocation $A_i = A_j$ is an equilibrium (see the bold cells in Table 2). If the ability of i and j are symmetric, this typical equilibrium structure of minimum-effort games (Van Huyck et al., 1990) is preserved as long as $\omega \geq 0.4$. Again, if $\omega < 0.4$, $\{0, 0\}$ is the unique equilibrium.

As we argue in Section 2.3, the role of ego-relevance in the equilibrium predictions appears through a modification of the cost-benefit ratio. In the case of ego-motivation, the value of $c/\tilde{b}$ would be lower than c/b, and as a consequence the null allocation equilibrium (i.e., $\{0, 0\}$) is less likely to occur. Imagine, for instance, that the ego-motivation utility is one-fifth of the monetary benefit b. The threshold defining the emergence of the $\{0, 0\}$ equilibrium would drop from four-tenths to one-third. Ego-protection would have the opposite effect, as $\tilde{c}/b$ is larger than c/b.

Imagine that the cost associated with ego-protection is one-fifth of c, and thus $\tilde{c}/b = 0.48$. The $\{0, 0\}$ equilibrium becomes more likely in this case as the expected ability requires to surpass a higher threshold. With this intuition in mind, we derive our first prediction:

Hypothesis 1 (H1): *The ego-relevance leads to a higher frequency of more extreme (i.e., full and null) allocations in Part 2.*

Regarding the team production functions, we would also expect more extreme allocations A_k under the best-shot production than under the complementary production due to the multiplicity of equilibria in the latter case. Therefore, we derive additional testable hypotheses based on the players' response to their beliefs about their teammate's allocation, A_k:

Hypothesis 2 (H2): *In the Best-Shot production treatment, participants' allocation decreases as their beliefs of their teammate's allocation increases.*

Hypothesis 3 (H3): *In the Complementary production treatment, participants' allocation increases as their beliefs of their teammate's allocation increases.*

Finally, the crossed effect of ego-relevance and the team production function is more convoluted. Note that Hypotheses H2 and H3 are written in terms of best-responses to beliefs about the teammate's expected allocation, and these best-responses go in opposite directions for the best-shot and the complementary team production functions. We argue that, to the extent that ego-relevance alters the distance between ability and the cost-benefit threshold, the crossed-effect needs to involve any possible difference in perceived ability with respect to the teammate. Hence, ego-relevance increase the responsiveness to the teammate's expected allocation.

Hypothesis 4 (H4): *Ego-relevance amplifies the response to the teammate's allocation beliefs. Under best-shot production, an increase in the teammate's expected allocation decreases the participant's own allocation. Under Complementary production, an increase in the teammate's expected allocation increases the participant's own allocation.*

3.4 Data collection procedure

We recruited subjects in April 2019 using the online platform www.prolific.ac with a fixed payment of £2.00 per subject, plus a bonus payment determined by subjects' decisions. The bonus was on average £1.52 (± 0.56 std. dev.). Since the experiment lasted 15 minutes on average, the payment was equivalent to a £14 hourly rate. We pre-selected subjects to be students within an age range of 18-25, and to be residing in the United Kingdom. The purpose was to have a homogeneous subject pool and a relatively homogeneous performance in the task. This sample targeting was common knowledge. The experiment was conducted in oTree (Chen et al., 2016).

We calculated the sample size given an error probability of 5%, power of 80%, allocation ratio of 1-to-1 and predicted effect sizes of Cohen's d=0.25. The resulting sample size is 416. In a pilot with 100 subjects, we observed that the effect size was smaller than predicted. We proceeded to recalculate the sample size using a linear multiple regression model R2 deviation from zero with small effect sizes (f2 = 0.02), the error probability of 5%, power of 80% and three main predictors (ego-relevance, nature of the production function, and the interaction between both variables). The required sample size was 550. We collected 590 observations to account for possible outliers, failures in the control quiz and incomplete observations. Our random assignment to the four treatments yielded 140 participants in the *Best-Shot Ego*, 154 in the *Best-Shot Non-Ego*, 148 in the *Complementary Ego*, and 148 in the *Complementary Non-Ego* treatments.

4 Results

In this section, we first present the descriptive results and proceed with the regression analyses. We report here all the treatment variations and experimental sessions we have conducted for this research question.

4.1 Descriptive statistics

Table 3 presents the descriptive statistics of our key variables of interest in Parts 1 and 2, as well as demographic characteristics, by treatment condition. The non-parametric Mann-Whitney tests reveal that, before controlling for other covariates, there is no difference between the treatments in subjects' allocation decisions ($p > 0.050$). The distributions of contributions are displayed, by treatment, in Figure A.1 (see Appendix).

We do not find any difference between treatments in the other elicited demographic characteristics, nor in the performance in Parts 1 and 2, with one exception: participants were more likely to pay for learning their scores from Part 1 or 2 in the *Ego* treatment (35%), compared to the *Non-Ego* treatment (20%). This difference is statistically significant (Fisher exact test with $p < 0.001$).

Note that we do not report either the individual or team scores in Table 3. The reason is that this computation will be stochastic, as it depends on the chosen subset of allocated questions that will account when computing these scores. Nonetheless, the net payoff reveals that participants in the best-shot treatment earned, on average, £0.6 more than in the complementary production treatment (t-test with $p-$value < 0.001).

	Ego-relevant				Non Ego-relevant			
	Complementary		Best-shot		Complementary		Best-shot	
Part 1: Initial Raven Matrices Test								
Correct matrices (out of 10)	8.24	(1.50)	8.00	(1.72)	8.20	(1.51)	7.88	(1.59)
Belief about own score	7.80	(1.57)	7.55	(1.80)	7.93	(1.49)	7.80	(1.52)
Confidence top half	71.08	(21.05)	70.63	(22.89)	72.84	(21.86)	70.53	(23.15)
Confidence top quarter	55.92	(28.54)	55.18	(27.83)	57.88	(28.33)	56.94	(27.33)
Part 2: Team Production								
Allocation decision	6.39	(2.72)	6.13	(2.64)	6.49	(2.68)	6.40	(2.69)
Correct matrices (out of 10)	7.33	(1.83)	7.28	(1.87)	7.39	(1.84)	7.14	(1.51)
Belief about teammate's allocation	6.47	(2.12)	6.16	(2.17)	6.27	(2.49)	6.13	(2.39)
Earnings								
Paid to learn score	35.8%		34.3%		18.9%		22.1%	
Payoff	1.19	(0.48)	1.84	(0.45)	1.25	(0.45)	1.81	(0.51)
Demographics								
Female	60.5%		59.7%		54.4%		62.1%	
Age	21.26	(2.22)	21.19	(2.22)	21.59	(2.27)	21.52	(2.26)
Taken Raven test before	14.9%		16.4%		9.5%		12.3%	
Oneness scale	2.66	(1.76)	2.39	(1.65)	2.78	(1.68)	2.51	(1.53)
Observations	148		140		148		154	

Table 3: Descriptive statistics by treatment

4.2 Responses to beliefs

Figure 1 displays the distribution of beliefs about the teammate's allocation, conditional on the participant's own allocation, by type of team production function. The left panel corresponds to the conditional beliefs under the best-shot production, whereas the right panel corresponds to the conditional beliefs for the case of complementary production. The distributions are sparser on the left panel, whereas the symmetric response (i.e., choosing an allocation that matches the belief about the teammate's allocation) is more frequent in the right panel, specially for allocation levels of 4 or more units. On the other hand, the proportion of null allocations, given the belief of a teammate's null allocation, is similar.

For the complementary production, the close correspondence between allocation decisions and beliefs about the teammate's allocation provides evidence of equilibrium behavior. That is, most of the participants aim at matching the same allocation decision they believe their teammate will do, as in minimum-effort games (Van Huyck et al., 1990).

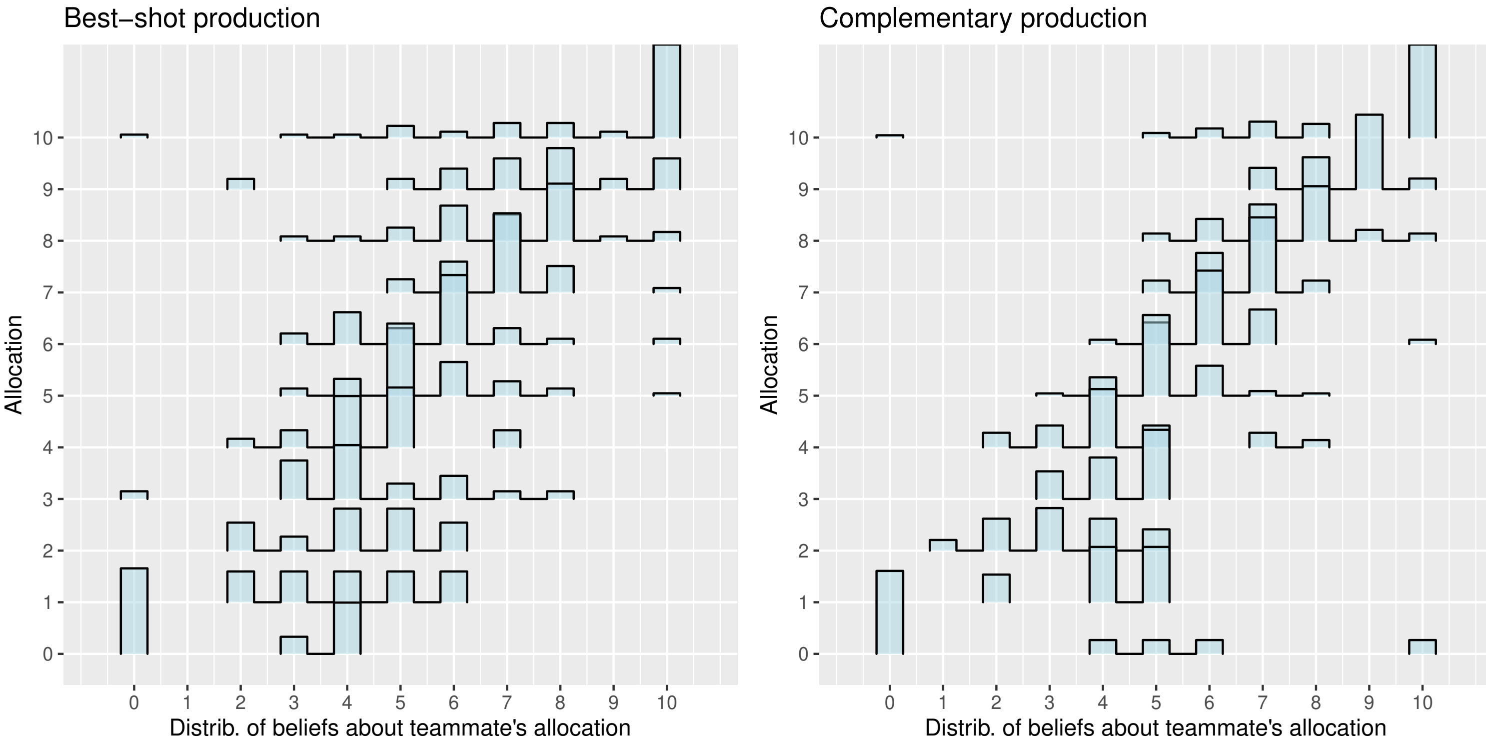

Figure 1: Distribution of beliefs about the teammate's allocation, by own allocation level. Panels correspond to team production functions.

By contrast, in the best-shot treatment the observed conditional distribution is far from the anti-coordination equilibrium predictions. It should have looked as taking a horizontally mirrored image of the right panel in Figure 1, but with a larger concentration of observations in the upper-left and bottom-right corners. Instead, the observed conditional distribution suggests that participants struggle to not reciprocate their beliefs' about their teammate's activation level. Compared with other experiments involving anti-coordination incentives–either the chicken game or a battle of the sexes–in our case it is less evident the participant's effort to "hit" these asymmetric of outcomes (Bornstein et al., 1997; Cooper et al., 1989; Wit and Wilke, 1992; Zizzo and Tan, 2007). This is much harder in our setting because the game is not repeated, and the action set is not binary.

We also plot the conditional distributions, dividing the sample by our ego-relevance treatments. Figure 2 reveals two differences between ego treatments. First, in the ego-relevant treatment there is a larger tendency to match the beliefs about the teammate's allocation with her own allocation. This pattern is similar to our findings for the Complementary production, and might

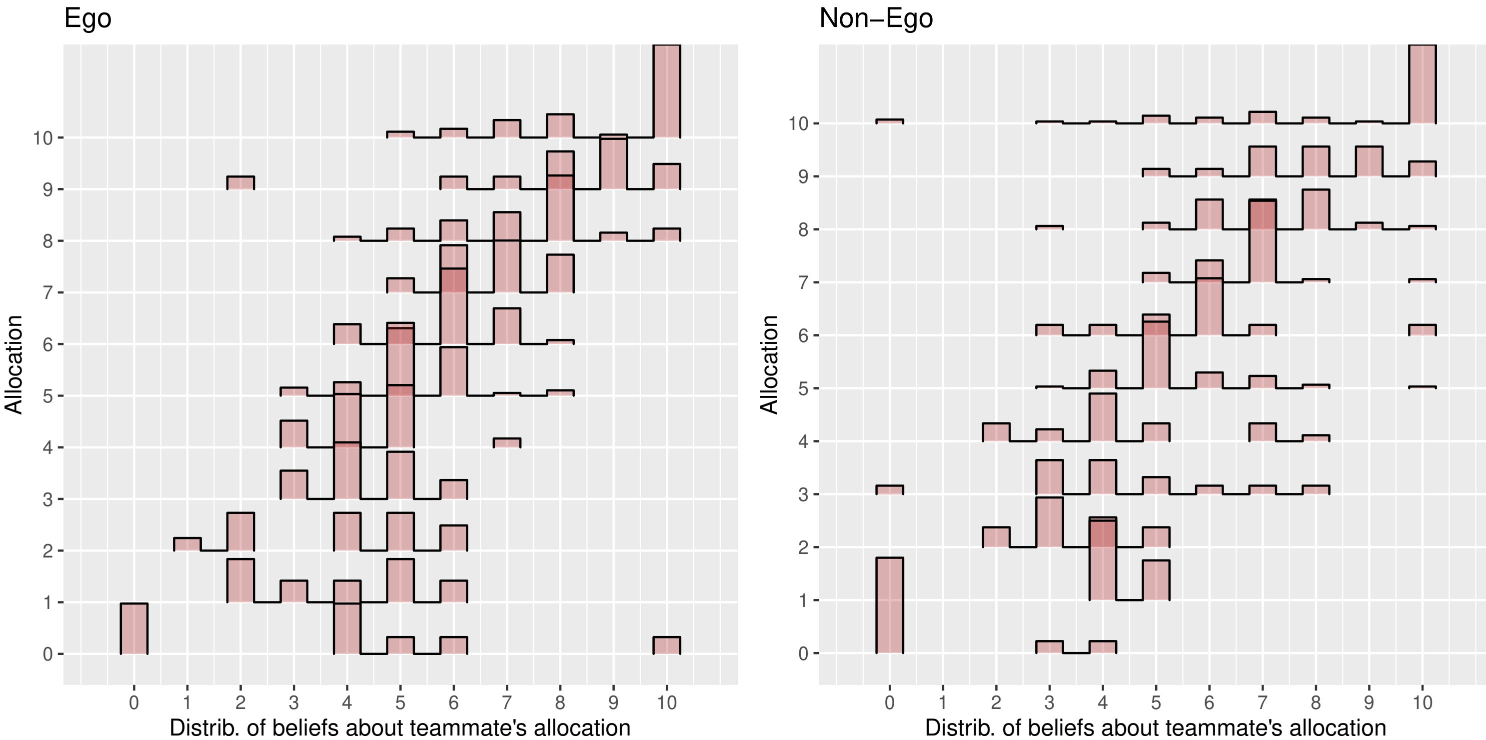

Figure 2: Distribution of beliefs about the teammate's allocation, by own allocation level. Panels correspond to ego-relevance treatment.

contribute to the explanation for this type of out-of-equilibrium behavior under the Best-shot production. Second, the ego-relevance decreases the frequency of null effort allocations and increases the full effort allocations. We argue that, even if the frequency of $A_k = 0$ decreases, this result goes in line with our predictions from H1. The reason is that the ability ω_k appears to be large in magnitude and low in variance according to the descriptive statistics reported in Table 3.

4.3 Main regression analysis

Table 4 reports the OLS analysis for the allocation decisions by looking at the treatment variables best-shot (compared to complementary production) and ego-relevance (compared to the baseline condition of non-ego). We also include the score in Part 1, which controls for the quality of the matching and the expected ability of the team, and for the beliefs about the teammate's allocation.

Models 1 and 2 confirm the expected role of ability: higher scores in Part 1 are signals of higher ability, leading to higher allocation levels. However, note that none of the treatment variables have statistically significant coefficients in these models. Models 3 and 4 add interaction terms between

VARIABLES	Allocation decision (1)	(2)	(3)	(4)
Best-shot	0.0421	0.0674	1.325**	1.319**
	(0.153)	(0.153)	(0.494)	(0.504)
Ego-relevant	-0.178	-0.117	-1.285**	-1.267**
	(0.152)	(0.151)	(0.479)	(0.478)
Score Part 1	0.366***	0.315***	0.371***	0.317***
	(0.0520)	(0.0605)	(0.0528)	(0.0624)
Beliefs (about teammate's allocation)	0.667***	0.640***	0.692***	0.659***
	(0.0398)	(0.0410)	(0.0606)	(0.0604)
Best-shot × Beliefs			-0.203**	-0.199**
			(0.0733)	(0.0751)
Ego-relevant × Beliefs			0.175*	0.182*
			(0.0707)	(0.0712)
Constant	-2.395***	-3.507***	-2.605***	-3.743***
	(0.406)	(0.831)	(0.509)	(0.854)
Additional controls	No	Yes	No	Yes
Observations	590	586	590	586
R-squared	0.468	0.475	0.483	0.489

Additional controls: guess about own score in Part 1, confidence of having a score in top half, gender, age and oneness scale. Robust standard errors in parentheses. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Table 4: OLS results for the determinants of the allocation decision.

the treatment variables and the beliefs, allowing us to better understand the differences between treatments.

We start with the differences between team production functions. Note that the allocation is higher under best-shot when the beliefs about the teammate's allocation are low. The left panel in Figure 3, based on the OLS results from Table 4, confirms that this is true for beliefs below seven allocated units. This effect is aligned with the prediction that, under best-shot production, the best-response to the expectation of a teammate's low allocation is to increase her own allocation.

We describe now the effects of ego-relevance on the allocation decision. Note that the coefficient for this variable is negative and statistically significant, whereas the interaction term with the beliefs is positive (and significant). It means that, for beliefs of a teammate's low allocation, ego-relevance reduces the participant's own allocation. Simultaneously, for beliefs of a teammate's high allocation, ego-relevance increases the participant's own allocation. The right panel in Figure 3 depicts this pattern, consistent with our description of the interplay between ego-relevance and the expected teammate's allocation.

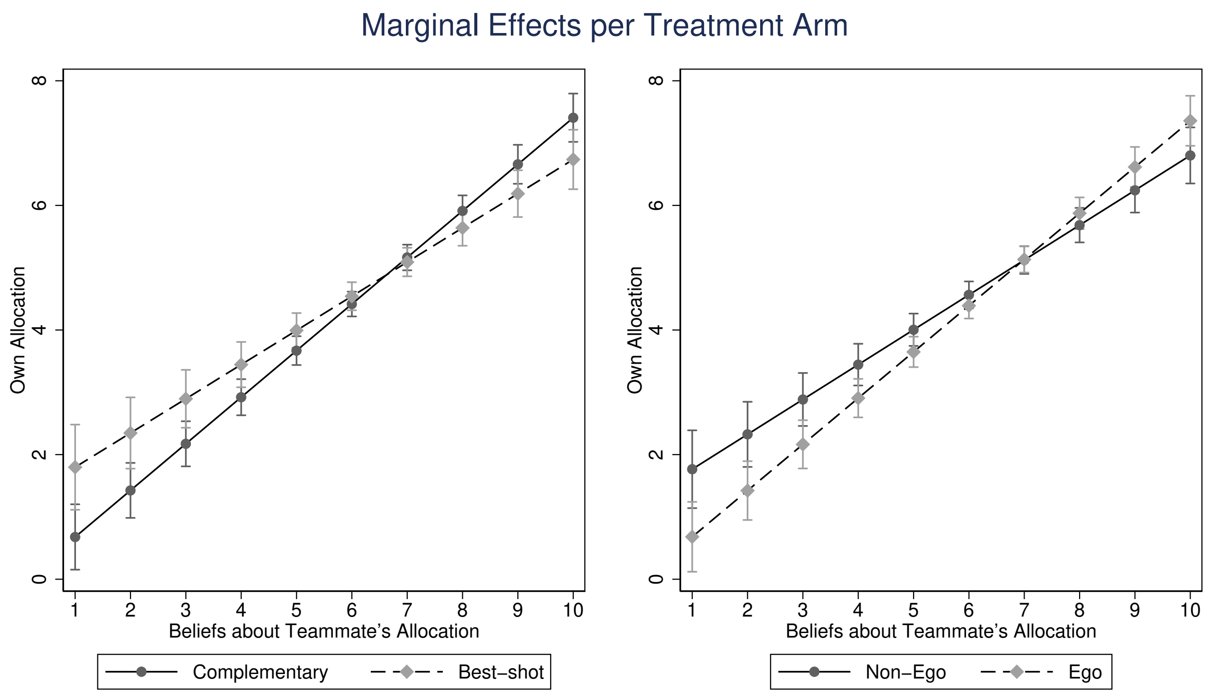

Figure 3: Subjects' allocation decision as a function of the beliefs about teammate's allocation. Error bars show 95% confidence intervals.

Although we cannot measure the beliefs about the teammate's ability, we assume that it is strongly correlated with the belief regarding the teammate's allocation. This assumption is useful because the variation in ability (and beliefs about ability) is very low compared to the variation in allocation decisions. If the assumption holds, ego-relevance leads to lower allocations in response to the belief of a teammate's low allocation level, because subjects take decisions based on $\tilde{c}/b$ instead of c/b. Conversely, ego-relevance also lead to higher allocations as a response to the belief of a teammate's high allocation level. In other words, ego-relevance increases the tendency to mimic the teammate's expected action.

We report in Table A.1, in the Appendix, a robustness check excluding participants in the *Non-Ego* treatment that knew beforehand about the Raven matrices task and their use for measuring IQ. In this alternative computation, we are excluding 11% (33 out of 302) of the participants in the *Non-Ego* treatment. The results are qualitatively identical, with the main difference that the magnitude interaction between ego-relevance and beliefs increases roughly 15%, and the coefficients become statistically significant at the 1% level.

Summing up, the left panel in Figure 3 reveals that the response to the teammate's allocation decision is steeper for complementary production. Since this game possess multiple coordination equilibria, participants aim to mimic their teammate's expected allocation. This behavioral pattern supports H3. By contrast, the positive slope in the case of best-shot production suggests that the play of anti-coordination equilibria is not observed in our experimental data, leaving H2 without strong support. Though it is insufficient, the only evidence partially supporting H2 is that, when the beliefs about the teammate's allocation are low, the allocation levels are higher under best-shot than under complementary production.

4.4 Measurement of cross-treatment effects

A tractable strategy to check whether the cross-treatment effects are mediated by beliefs about teammate's contributions is a Wald-like (or Chow-like) test.[2] We conduct separate regressions for the subsamples of *Ego-Relevant* and *Non-Ego-Relevant* treatments, and then compare the coefficients for the *best-shot* treatment, and its interaction term with beliefs, between the two regressions. Similarly, we conduct separate regressions for the subsamples of *complementary* and *best-shot* treatments, and we then compare the coefficients for the *Ego-Relevance* variable, and its interaction with beliefs, between the two regressions.

The results of this exercise are reported in Table 5. We find that cross-treatment effects are not moderated by beliefs. This evidence points in the direction that the two treatment effects operate independently, leaving H4 without empirical support. An additional explanation for the lack of crossed-effects between treatments is that ego-relevance does not directly affect the best-response functions, but only modifies the threshold imposed by the cost-benefit ratio. The ability ω was large, according to the performance in Part 1. With ω far from the threshold, the chances of observing an interaction between treatments is diminished.

4.5 Additional evidence on ego-relevance

Table 3 revealed that participants in the *Ego-Relevant* condition were more likely to pay and receive feedback on their scores from Part 1, 2, or both. Figure 4 confirms this finding. It also reveals that most of the additional proportion of participants paying to learn their scores revealed their performance in Parts 1 and 2. This result suggests that our ego-relevance manipulation was successful, and it allows us to explore whether the decision to pay for this feedback is moderated by the subjects' self-esteem.

[2]We also conducted a regression with a triple interaction. This interaction term is non-significant. Although these results are not reported in the paper, they are available upon request or they can be easily replicated with our publicly available dataset.

VARIABLES	Selected subsample Non-ego (1)	 Ego (2)	 Complementary (3)	 Best-Shot (4)
Best-shot	1.448	1.085		
	(0.749)	(0.646)		
Ego-relevant			-1.250*	-1.359
			(0.608)	(0.752)
Beliefs (about teammate's allocation)	0.662***	0.827***	0.678***	0.433***
	(0.0702)	(0.0605)	(0.0671)	(0.0892)
Best-shot × Beliefs	-0.214	-0.165		
	(0.113)	(0.0951)		
Ego-relevant × Beliefs			0.179*	0.195
			(0.0891)	(0.113)
Constant	-3.772***	-4.808***	-3.156**	-3.013*
	(1.109)	(1.241)	(1.126)	(1.261)
Chi-squared tests. $p-$values in squared brackets []				
χ^2 test: Best-shot (1) vs. (2)	0.14	[0.709]		
χ^2 test: Best-shot × Beliefs (1) vs. (2)	0.12	[0.731]		
χ^2 test: Ego-relevant (3) vs. (4)			0.01	[0.909]
χ^2 test: Ego-relevant × Beliefs (3) vs. (4)			0.01	[0.913]
Observations	300	286	294	292
R-squared	0.446	0.543	0.568	0.420

Additional controls in all models: guess about own score in Part 1, confidence of having a score in top half, gender, age and oneness scale. Robust standard errors in parentheses. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Table 5: OLS results for combined effects of ego-relevance, nature of team production and beliefs about teammate's contributions. $p-$values corresponding to tests for seemingly unrelated estimations reported in brackets next to the χ^2 estimate.

Table 6 reports the marginal effects of a probit model. Here, the dependent variable is equal to 1 when the participant paid to reveal her score in Part 1, 2, or both; and zero otherwise. The estimated increase in the probability to pay for this information under *Ego-Relevance* condition, of 13 percentage points, is aligned with ego-motivation. The three models differ in the variable used as a proxy for initial confidence levels about task performance. It includes guesses of the participant's score, and their confidence in scoring in the top half and the top quarter among all subjects (Tice, 1991). The negative coefficients, which are significant in models (1) and (2), suggest that more confident subjects are less likely to pay and learn their scores. This result is partly aligned with Tice's (1991) hypothesis that prior self-esteem affects self-handicapping behaviour.

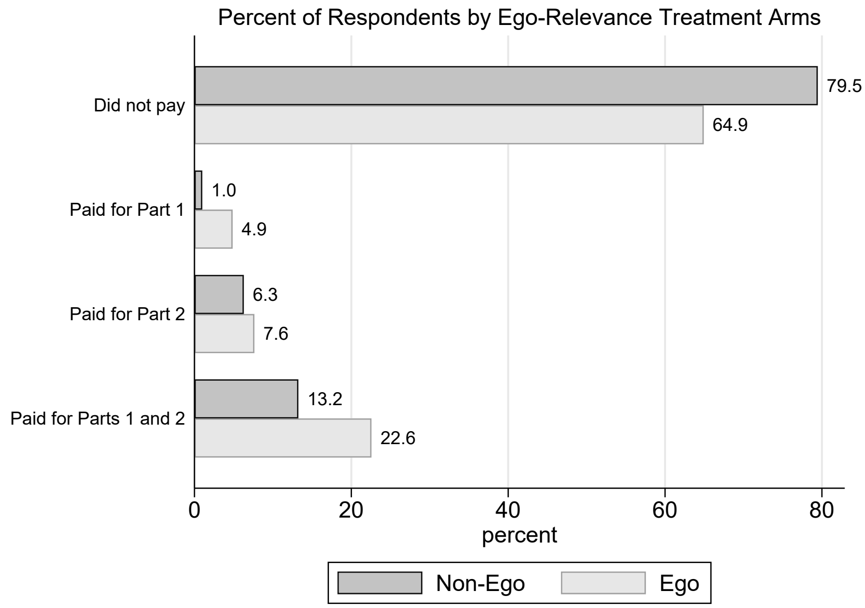

Figure 4: Distribution of payment decisions for learning the scores in Parts 1 and 2 at the end of the game. Each score revelation costs £0.10.

VARIABLES	Paid to reveal at least one score		
	(1)	(2)	(3)
Ego-Relevant	0.133***	0.132***	0.132***
	(0.0362)	(0.0363)	(0.0364)
Above median: Guess correct response	-0.0795*		
	(0.0402)		
Above median: Belief Top 50%		-0.0814*	
		(0.0381)	
Above median: Belief Top 25%			-0.0468
			(0.0379)
Observations	586	586	586

Additional controls: Performance in Part 1, gender, age and oneness scale. Robust standard errors in parentheses. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Table 6: Marginal effects from probit model for the decision to pay and learn at least one score

5 Concluding discussion

We designed and conducted an online experiment to understand how ego-relevance affects individual allocations to a team production task. We devised two different technologies for team production. Under best-shot production, participants have theoretical incentives to "anti-coordinate" their allocations, since the team output depends on the maximum individual performance. Under complementary production, participants have incentives to coordinate on an identical allocation, since the team output has the structure of a minimum-effort game. The introduction of ego-relevance alters the ability threshold they expect from their (symmetric) teammate to opt for a positive allocation. Moreover, we predict that the best-response to their teammate's allocation effort becomes steeper with ego-relevance.

We find that participants often select an allocation level that matches their teammate's expected allocation. This behavior matches the predicted coordination equilibria under complementary production, and it is also observed–although with considerable noise–under best-shot production. Nevertheless, in the latter case this result drives behavior away from the predicted anti-coordination equilibria. Other games involving these asymmetric outcomes are more successful, perhaps due to their repeated nature and more compact action set (Bornstein et al., 1997; Wit and Wilke, 1992).

We also find that ego-relevance makes steeper the reaction to the teammate's allocation. Following Figure 2, ego-relevance increases the chances of mirroring the expected teammate's allocation. Our model does not account for this mechanism related to ego-relevance, since we predicted that its main effect is to alter the threshold leading to a null allocation equilibria. A behavioral *ex post* conjecture is that ego-relevance raises the salience of symmetry in the allocation decision. As teams are relatively homogeneous in their ability, ego-relevance seems to help the participants in mimicking their teammate. This is not necessarily a "good" behavior, from the perspective of resource allocation, because it neglects the nature of team production. Team tasks resembling our best-shot structure would be negatively affected if team-members aim to mirror their mates.

A caveat in our experimental design regarding external validity is the homogeneity in teams' ability. We opted for pairing subjects with similar abilities to simplify our predictions, aiming to understand the ego-relevance of the task without confounding this effect with other ego-utility factors associated to heterogeneity in abilities. However, it is entirely plausible that the nature of the anti-coordination equilibria would be better understood under such heterogeneities. Moreover, endogenous teams embedded in a best-shot structure of production are probably heterogeneous in abilities, giving more room for anti-coordination equilibria to emerge. In the same line, a more heterogeneous sorting in ability could have led to a stronger manipulation of ego-relevance.

This type of more intense ego manipulation might have revealed crossed-effects between treatments that we do not observe.

Acknowledgements

This research was funded by Research Project Fund of the University of Portsmouth, Faculty of Business and Law. Financial Support from the program *"Inclusión productiva y social: programas y políticas para la promoción de una economía formal, código 60185, que conforma la Alianza EFI, bajo el Contrato de Recuperación Contingente No. FP44842-220-2018."* is also gratefully acknowledged.

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Ego-relevance in team production: Online Appendix

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A Additional Figures and Tables

The replication files can be downloaded from: `10.17632/7mfdv9dr2x.1`

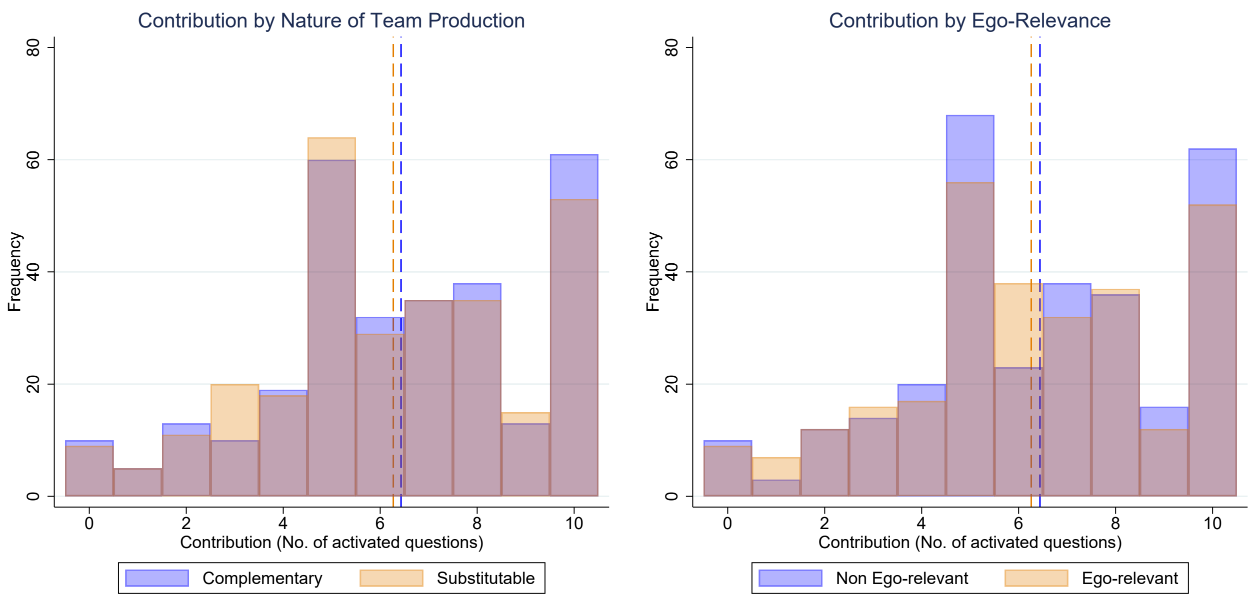

Figure A.1: Distribution of contribution (i.e., activation) decisions by the nature of the team production task (left panel) and ego-relevance (right panel). The dashed vertical lines correspond to the average contribution per treatment variation.

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	Allocation decision			
VARIABLES	(1)	(2)	(3)	(4)
Best-shot	0.0136	0.0357	1.385**	1.352**
	(0.160)	(0.159)	(0.516)	(0.523)
Ego-relevance	-0.143	-0.0878	-1.396**	-1.363**
	(0.159)	(0.158)	(0.500)	(0.496)
Score Part 1	0.371***	0.327***	0.371***	0.324***
	(0.0525)	(0.0610)	(0.0534)	(0.0632)
Beliefs (about teammate's allocation)	0.661***	0.637***	0.674***	0.644***
	(0.0415)	(0.0428)	(0.0635)	(0.0632)
Best-shot $\times$ Beliefs			-0.219**	-0.210**
			(0.0774)	(0.0786)
Ego-relevance $\times$ Beliefs			0.200**	0.204**
			(0.0747)	(0.0748)
Constant	-2.415***	-3.605***	-2.522***	-3.755***
	(0.415)	(0.852)	(0.526)	(0.878)
Observations	557	554	557	554
R-squared	0.455	0.465	0.473	0.482

Additional controls: guess about own score in Part 1, confidence of having a score in top half, gender, age and oneness scale. Robust standard errors in parentheses. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Table A.1: OLS results for the determinants of the allocation decision excluding participants in the *Non-Ego* treatment that knew about the Raven matrices task (33 out of 303).

B Team production with one subtask

Imagine the same production function in Section 2, but assume that $A_k \in \{0, 1\}$. In this case, we can write they payoffs in a 2×2 matrix.

Let us start with the case of Best-shot production. Table B.1 displays the payoffs for player i in the four possible allocation scenarios. We do not report player j's payoffs, but the matrix is symmetric. If player i expects $A_j = 1$, she opts for $A_i = 1$ if $-c + b \cdot \max(\omega_i, \omega_j) > b\omega_j$. This expression can be rearranged as $\max(\omega_i, \omega_j) - \omega_j > c/b$, which is strictly greater than zero only if $\omega_i - \omega_j > c/b$. That is, player i matches the positive allocation of player j only if she believes that her ability in solving the task is considerably higher than her teammate's ability. If player i expects $A_j = 0$, she opts for $A_i = 1$ if $\omega_i > c/b$.

	$A_j = 1$	$A_j = 0$
$A_i = 1$	$e - c + b \cdot \max(\omega_i, \omega_j)$	$e - c + b\omega_i$
$A_i = 0$	$e + b\omega_j$	e

Table B.1: Payoffs for player i under Best-shot team production.

Recall that the payoff matrix is symmetric. Hence, players i and j have incentives to select the opposite action their teammate will pick as long as the differences in ability are no larger than c/b. This is the anti-coordination equilibria we described in Section 2.1.

We move now to the case of complementary production. Table B.2 displays the (symmetric) payoffs for player i in the four possible allocation scenarios. If player i expects $A_j = 1$, she opts for $A_i = 1$ if $\min(\omega_i, \omega_j) > c/b$. That is, player i chooses a positive allocation if she believes that the player with the lowest ability exceeds c/b. If player i expects $A_j = 0$, she will choose $A_i = 0$ because $c > 0$.

	$A_j = 1$	$A_j = 0$
$A_i = 1$	$e - c + b \cdot \min(\omega_i, \omega_j)$	$e - c$
$A_i = 0$	e	e

Table B.2: Payoffs for player i under Complementary team production.

Recall that the matrix is symmetric. Therefore, to the extent that one player believes that her teammate will make a positive allocation (because the ability ω surpasses c/b), her best-response is to make a positive allocation. Conversely, if one player believes that her teammate will make a null allocation, her best-response is to imitate this behavior. This is the coordination equilibria we described in Section 2.2.

C Protocol

Consent form

Please read the consent form below and press the continue button if you agree to each bullet point.

- I voluntarily agree to take part in this study.
- I have been given a full instruction by the investigators of the nature, purpose, location and likely duration of the study, and of what I will be expected to do.
- I consent to my data that I provide in this experiment being used for this study. I understand that all personal data relating to volunteers is anonymised and held and processed in the strictest confidence. I understand that the research data will be used for producing a research article to be published in scientific journals. The anonymised data may be published as an open-access data source.
- I understand that I am free to withdraw from the study at any time during the experiment without needing to justify my decision and without prejudice. I also understand that if I withdraw from the study once the study is finalised I can ask for my data to be deleted by providing my Prolific ID.
- I acknowledge that in consideration for completing the study I shall receive earnings at the end of the study. I recognise that I will receive £2 plus additional payment that will depend on my and other participants' decisions as explained in the instructions for the experiment.
- I confirm that I have read and understood the above and freely consent to participating in this study. I have been given adequate time to consider my participation and agree to comply with the instructions and restrictions of the study.

Instructions

Welcome to our study! You will receive £2 for participating in this study. Plus you can earn additional money depending on your decisions during the study. Please read and follow the instructions carefully. They contain everything you need to know.

Part 1: *IQ Task/ Pattern Task*

```
Note 1: treatment variations are displayed in italics.
Note 2: this paragraph appears only in the ego-relevance treatment.
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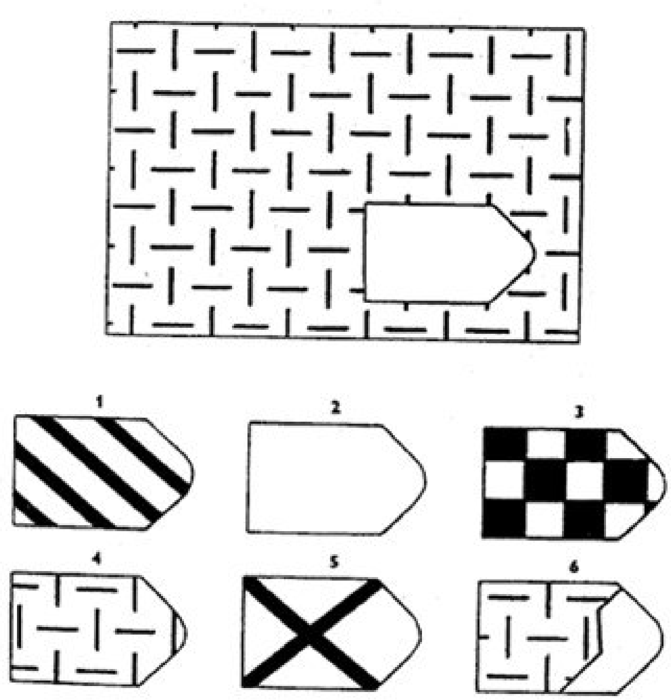
The Part 1 tasks are taken from an Intelligence Quotient (IQ) test that is commonly used to measure people's intelligence levels. Previous research has shown that people scoring high in IQ tests have been found to get higher salaries, obtain better job position and report higher satisfaction with their lives.

You will be shown 10 patterns with a missing element. Your task is to select the option that completes the pattern from several options given at the bottom of the screen. An example pattern is provided below, where option 4 is the correct answer.

You will have 2 minutes to complete a set of 10 patterns. Each correct answer will add 1 point to your score and wrong answers will not affect your score.

Your score does not increase your payment in Part 1, but in Part 2 you will be matched to a teammate with the closest score to yours. This may determine your payments in Part 2 of the Study. So it is in your interest to score as high as you can.

Everyone else will complete the same set of *IQ/Pattern* tasks.



Please click Continue to start the *IQ/Pattern* Task.

Execution of Part 1's Raven Task

Belief elicitation after completing Part 1's Task

Thanks for completing the *IQ/Pattern* Task.

1. Please tell us how many tasks out of 10 you think you got right?
2. Please tell us how confident you are that your score is in the top half of all other scores of all participants in this study by moving the slider below. That is, if we ranked all scores from highest to lowest, how confident are you that your rank would be in the top 50% of all scores?

(If you are completely sure your score is in the top half, choose 100% confident. If you are completely sure your score is not in the top half, then choose 0% confident. Choose intermediary values if you are uncertain whether your score is in the top or bottom half of all scores. Please try to express your confidence in scoring in the top half as accurately as you can.)

3. Also tell us how confident you are that your score is in the top quarter of all other scores by moving the slider below. That is if we ranked all scores from highest to lowest, how confident are you that your rank would be in the top 25% of all scores.

(If you are completely sure your score is in the top quarter, choose 100% confident. If you are completely sure your score is not in the top quarter, then choose 0% confident. Choose intermediary values if you are uncertain whether your score is in the top quarter of all scores. Please try to express your confidence of scoring in the top quarter as accurately as you can.)

Team Decision: *[Complementary/Substitutable Team Production Manipulation]*

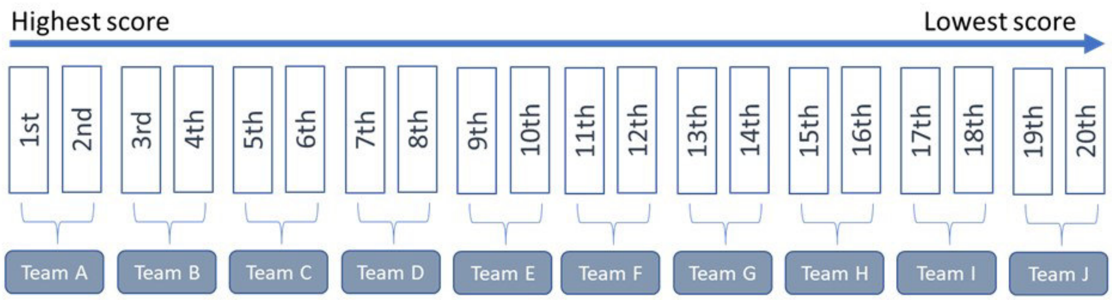
Your scores in previous *IQ/Pattern* Task were calculated. We will rank all 20 participants (including you) depending on the scores in the Task. Depending on your score and your rank, you will be matched with another person as shown below to form a Team. We will know your scores, but unfortunately, you will not learn what score you or your teammate achieved or who your teammate is at any point of the study.

In this part of the experiment, you will have to complete a new set of 10 *IQ/Pattern* Tasks in 2 minutes. Your earnings will depend on your and your teammate's decisions and scores.

You are about to answer a new set of 10 *IQ/Pattern* Tasks. You have to decide how many, but not which ones, of the Tasks will be used to compute your payment. We call them the ACTIVATED answers.

You are now given an additional £1.00 that you can spend to activate your answers from the *IQ/Pattern* Task. Activating each answer costs £0.10.

The software will randomly select the number of ACTIVATED answers out of the 10 *IQ/Pattern* Tasks to calculate your ACTIVATED score.



YOUR ACTIVATED SCORE, TEAMMATE ACTIVATED SCORE and TEAMSCORE

Your additional earnings from this study depend on your TEAMSCORE.

The TEAMSCORE will be the *MINIMUM/MAXIMUM* between your own and your teammate's ACTIVATED score. That is, your TEAMSCORE depends on the *MINIMUM/MAXIMUM* number of correct answers you and your teammate got among the ACTIVATED answers.

TEAMSCORE = *Minimum/Maximum* (Your Activated Score; Teammate Activated Score)

You and your teammate will simultaneously decide how many answers to activate. It means that both you and your teammate will earn the same amount from working on IQ/Pattern task, but your total activation costs may differ depending on how many questions each of you decided to activate. We will subtract your activation cost from the additional £1.00 that you are given in this part.

Your earnings

To calculate your earnings, we will multiply your TEAMSCORE by £0.25 and subtract your cost of activating the questions. Your additional earnings will be equal to £1 that we give you to activate answers minus the £0.10 multiplied with the number you choose to activate plus your TEAMSCORE multiplied with £0.25. The formula for this is as below:

Additional Earnings = £1.00 - £0.10 × ACTIVATED ANSWERS + £0.25×TEAMSCORE

At the end of the study, you will learn about your additional earnings, but you will not learn what your and your teammate's scores were or how many answers your teammate activated.

Let's look at an example to better understand how your earning will be calculated.

Example 1

You and your teammate decide to activate all 10 of the answers. Since you have both activated all 10 answers, the software will look at the correctness of all your answers. Suppose YOUR

ACTIVATED SCORE was 9 questions right and your TEAMMATE's ACTIVATED SCORE was 7 questions right. Then the TEAMSCORE will be *9/7*, since *9/7* was the *MAXIMUM/MINIMUM* score between you and your teammate ACTIVATED score. Your and your teammate's earnings will thus be: £1.00 - £0.10×10 + £0.25 × *9/7* = *£2.25/1.75*.

Example 2

You have chosen to activate 7 answers and your teammate have chosen to activate 4 answers. The software randomly activates 7 out of the 10 answers from the set of 10 *IQ/Pattern* tasks, and then checks how many are correct. The software randomly activates 4 out of the 10 answers of your teammate from the set of 10 *IQ/Pattern* tasks, and then checks how many are correct. Suppose your ACTIVATED SCORE is 6 of 7 answers. Suppose your TEAMMATES' ACTIVATED SCORE is 2 of 4 answers.

Then the TEAMSCORE will be *6/2*, since *6/2* was the MAXIMUM/MINIMUM number of correct answers between you and your teammate. Your final earnings will be £1.00 + £0.25× *6/2* - £0.10×7 = *£1.80/0.80* and your teammate's earnings will be £1.00 + £0.25 × *6/2* –£0.10×4= *£2.10/1.10*.

You will only learn about your final earnings, but not about your or your teammate's correct answers.

Quiz [Correct answers in bold]

To make sure you understood how your earnings will be calculated, please answer the following quiz on your screen. You will not be able to proceed to the study unless you can answer all questions.

Q1: You activated 4 answers and your teammate activated 0 answers. You answered correctly 3 out of the 4 randomly selected questions.

Select the correct answer:

- Your activated score will be: **a) 3** b) 4 c) 5 d) 0
- Your teammate activated score will be: a) 3 b) 4 c) 5 **d) 0**
- Your team score will be: **a) 3**, b) 4, c) 5, **d) 0**
- Your earnings will be: **a) less than your teammate's earnings,** b) larger than your teammate earnings, c) equal to your teammate earnings.
- YOUR ACTIVATED SCORE: **[3]**

- TEAMMATE'S ACTIVATED SCORE: **[0]**
- TEAMSCORE: **[3/0]**
- Your earnings: **[£1.35/£0.60]**
- Your teammate's earnings **[£1.75/£1.00]**

Q2: You and your teammate activated 6 answers each. Suppose you have answered 5 of the 6 randomly selected questions correctly, while your teammate answered 6 out of 6 questions correctly.

Select the correct answer:

- Your activated score will be: a) 3 b) 4 **c) 5** d) 0
- Your teammate activated score will be: a) 3 b) 4 c) 5 **d) 6**
- Your team score will be: a) 3, b) 4, **c) 5, d) 6**
- Your earnings will be: a) less than your teammate's earnings, b) larger than your teammate earnings, **c) equal to your teammate earnings.**
- YOUR ACTIVATED SCORE: **[5]**
- TEAMMATE'S ACTIVATED SCORE: **[6]**
- TEAMSCORE: **[6/5]**
- Your earnings: **[£1.90/£1.65]**

Additional questions:

- Will you learn how many questions your teammate activated? Yes/**No**
- Will you learn how many questions you or your teammate answered correctly? Yes/**No**
- Will you learn your final earnings? **Yes**/No

Part 2: Activation Decisions

How many questions do you think your teammate will activate? (If you guess it right we will add £0.20 to your earnings)

Please choose how many questions you want to activate.

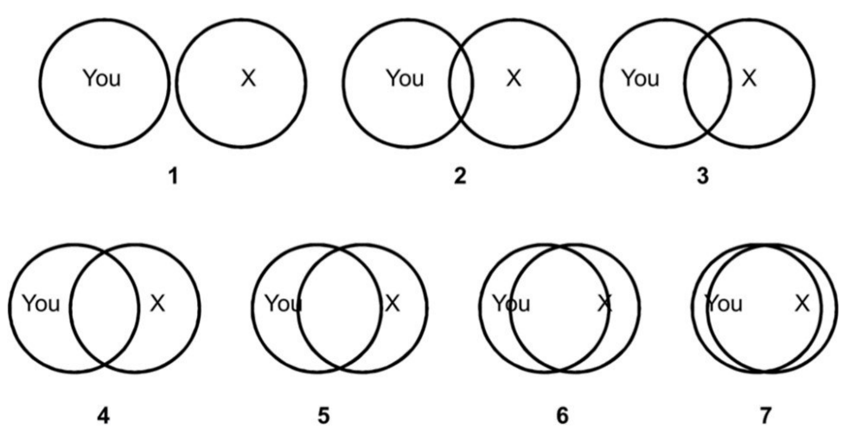
Bear in mind that each activated question will cost you £0.10 as explained before, so please make sure you are certain of your choice before pressing submit. You will not be able to go back to change your decision.

Execution of Part 1's Raven Task

Questionnaire

This is the end of Part 2. Before proceeding to the payment stage please fill in the following questionnaire.

- Gender
- Age
- Nationality
- Have you ever taken the *IQ Test/Pattern* Task before? Yes/No
- What are your thoughts on the task you completed? [Open Ended]
- *What do you think Pattern Task measures?* [Open ended - Only in Non-Ego treatment]
- *How accurate do you think IQ task measures person's general intelligence level?* [Open ended - Only in Ego treatment]
- Please tell us what determined how many questions you chose to activate? [Open ended]
- Suppose your teammate is called X. Please choose the number of the picture below which best describes your relationship with your teammate X based on your experience in this study?



- Is there anything you would like us to know about your decision process during the experiment? [Open ended]

Would you like to learn what your score was in the *IQ/Pattern* Task? If yes, please choose which score you want to learn and we will show your scores in the final stage. This will cost you £0.10 each (to be subtracted from your earnings if you have positive earnings).

☐ Part 1: IQ/Pattern Task Score (costs £0.10)

☐ Part 2: IQ/Pattern Task Score (costs £0.10)

☐ Part 1 and 2: IQ/Pattern Task Score (costs £0.20)

☐ I do not want to learn my scores (costs £0.00)

Final Screen

Please provide your Prolific ID so that we can send to you results of your decisions and your final earnings amount.

You activated [ ] questions so your cost was [ ].

[If chosen to learn scores] – You answered [ ] and [ ] questions out of 10-items in your IQ/Pattern task. We will let you know of your TEAMSCORE and respectively your earnings once all participants have completed the study.