

# Biased cost and benefit estimations facilitate the effectiveness of cooperative costly signals in humans

Eva Kundtová Klocová<sup>1</sup>, Katarína Čellárová<sup>2</sup>, Radim Chvaja<sup>3,4</sup>, Alexandra Ružičková<sup>1</sup>, Martin Lang<sup>1</sup>

<sup>1</sup>Masaryk University, Brno, Czech Republic, <sup>2</sup>Charles University, Prague, Czech Republic, <sup>3</sup>University of Otago, Dunedin, New Zealand, <sup>4</sup>European Research University, Ostrava, Czech Republic

## INTRODUCTION

Human cooperative intentions are intrinsically hidden from other people: willingness to help, support important values, or abide by mutually binding norms are all confined to the mind.

While people can verbally advertise their intentions, verbal communication from unknown others is often mistrusted because it can be easily faked. To lend credibility to their words, people advertise their cooperative intentions using symbolic gestures that are associated with substantial costs.

However, while such costly signals of cooperative intentions are found across human societies, it is puzzling why people lacking cooperative intentions do not perform the costly gesture and then just free-ride on the collective effort of their partners, especially in one-shot interactions.

We propose that the effectiveness of costly signals is facilitated by the specific architecture of the human mind. Specifically, we suggest that automatic cognitive processes that compute costly signals' utility rely on biased cost and benefit estimations of cooperative signals. The intuitive processes generate a parameter space where uncommitted individuals perceive the utility of increasingly costly signals as negative, deterring them from joining and free-riding the collective effort.

## HYPOTHESES

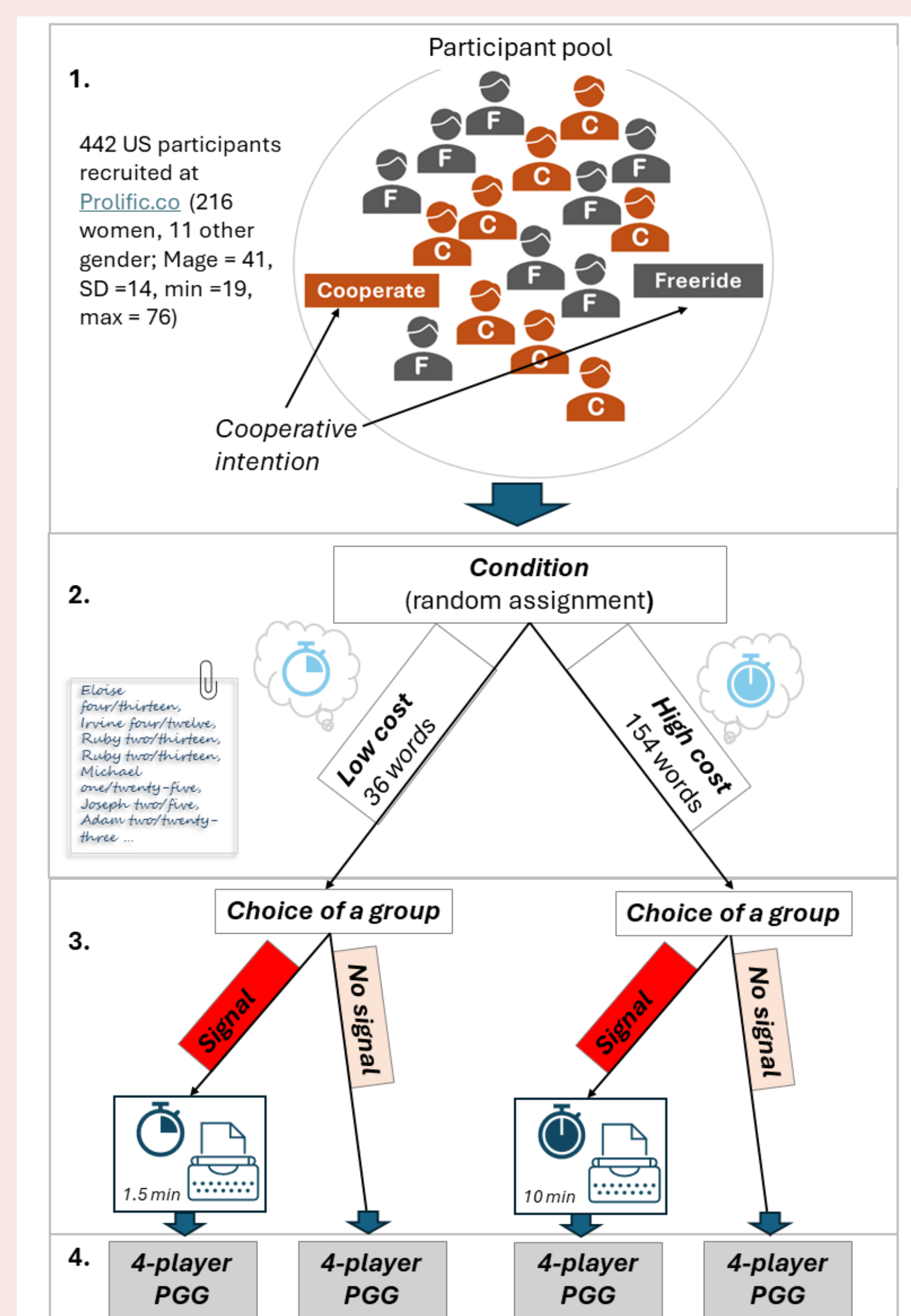
(H1.1) Cooperators will be more likely to choose the signaling option than participants with selfish strategies, and (H1.2) this difference will be larger in the high cost compared to the low cost condition.

(H1.3) Cooperators will perceive the benefits of signaling to be larger (i.e., expect larger contributions in the signal compared to the non-signal group) than participants with selfish strategies, and (H1.4) this difference will be larger in the high cost compared to the low cost condition.

(H1.5) Cooperators will perceive the costs of signaling to be smaller (i.e., expect the transcription task will take them fewer minutes) than participants with selfish strategies, and (H1.6) this difference will be larger in the high cost compared to the low cost condition.

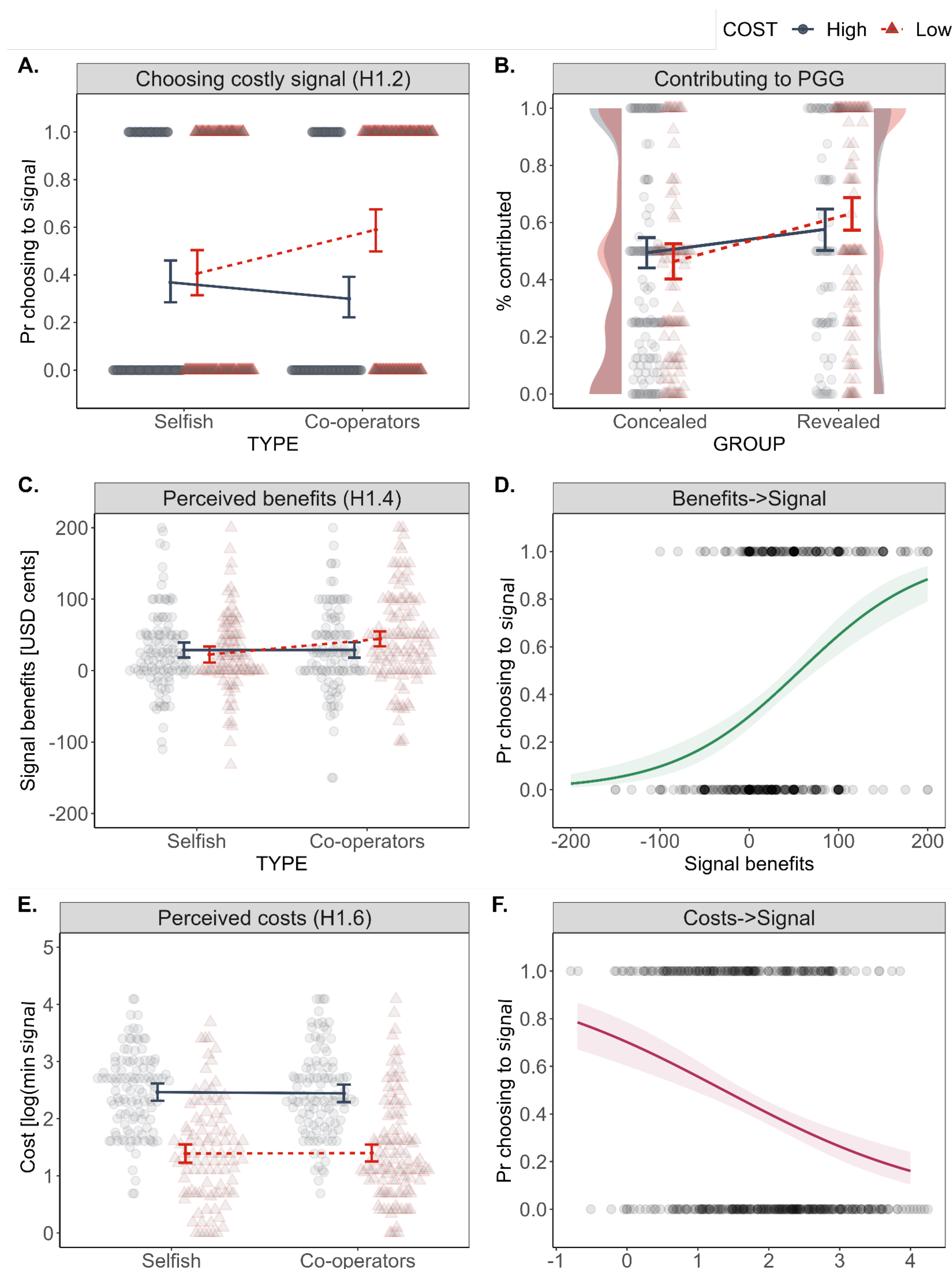
## METHODS

Between subjects design with 2 factors - one manipulated: signal costliness with two levels (1.5 min transcription vs 10 min transcription), and one measured: cooperative strategy in PGG (conditional contribution procedure, Fischbacher et al., 2001). The main outcome variable is the choice whether to signal cooperative intentions using the costly signal or not.



Participants were first scored on their cooperative intentions (1.) and then assigned to either low or high cost conditions (2.). Next, participants were asked to estimate how long it's going to take them to transcribe the text and how much others in the signaling and non-signaling groups will contribute to the common pool. Afterwards, participants selected whether they wanted to join a signaling group and pay the cost - transcription task (3.) and played Public Goods Game with three other players (4.).

## RESULTS



## FOLLOW-UP STUDY

We further tested a religious signal that referred to religious devotion rather than cooperation. The procedure was the same as in the previous study (473 US participants recruited at Prolific.co, 231 women, 8 other gender; Mage = 40, SD = 13, min = 18, max = 82), except that we recruited religious and secular people. The transcription was composed of names of biblical books. Religiosity strongly predicted the choice of a costly signal in the high cost but not low cost condition. However, the perceived cooperative benefits of signaling did not explain this difference (although the perceived benefits generally predicted signal choice).

## CONCLUSION

A mediated moderation shows that the estimated benefits do indeed mediate group selection differently for cooperators and free riders (although they only have an effect in the low cost not in the high cost condition).

We were able to measure the perceptual bias that distinguishes cooperators and free-riders (though only in the low cost condition).

Even a small cost is enough, the larger it is, the less chance it has of being chosen by cooperators. It is risky, given that the signal guarantees nothing; with a larger cost of producing the signal (time spent) the person must be all the more certain of gaining much larger benefits.

We believe that religious people get additional benefits from the signaling task that explains their choice above benefits from cooperation.

## FUNDING

This work was funded by the generous support from the Czech Science Foundation (GACR) [05655S].

