

Competition and Loss Framing in a Real-Effort Task: Preventing a Loss Makes Women More Competitive

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This version: July 24, 2026

Abstract

This paper reports the results from a real effort experiment ($N = 217$) studying the effect of a gain/loss framing with and without competition on performance. The data show that women react negatively to competition and loss framing but show a strong positive interaction effect for the two; i.e. preventing a loss makes women more responsive to competition. Men remain largely unaffected by the respective framings.

Keywords: Real Effort, Gain/Loss Framing, Competition

JEL codes: C91, D01, J16

Declarations of interest: none

Use of AI: No AI was used in the preparation of this manuscript.

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

*Acknowledgements: We are grateful to Adrian Bruhin for helpful discussions and to Tobias Schütze for research assistance. The usual disclaimer applies.

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1 Introduction

In the present paper, we report results from a (pen and paper) real effort experiment testing whether framing a task as preventing a loss instead of generating a gain affects the way in which people respond to adding a competitive component to the task.

Various earlier studies suggest, for example, that women are less likely to enter competitive environments than men (e.g. Niederle and Vesterlund, 2007) that competition often has a negative effect on the relative performance of women (e.g. Gneezy et al., 2003, Ors et al., 2014; see also Niederle and Vesterlund, 2011, for a more general discussion), and that in a repeated competition not winning has a stronger negative effect on future performance for women (Gill and Prowse, 2014). Likewise, different genders have been found to respond differently to gain/loss frames, for example, in relation to cheating (Grolleau et al., 2016), generosity (Cochard et al., 2020), or effort contributions to public goods (Schütze and Wichardt, 2026).

Combining both aspects, we were interested in whether there might also be a gender effect in the response to competition depending on whether the context is framed as a gain or a loss. In particular, given that losses are famously said to loom larger than gains (Kahneman and Tversky, 1979, p.279), a loss framing might provide stronger incentives to engage in competition as a further attempt at hedging. Accordingly, we designed a real effort experiment which allowed us to study this question. The data show that, in our pen and paper setting, both loss framing and (less so) competition show a negative impact on performance by women. The interaction of both proves to have positive effect – in our data almost twice the size of negative effect of competition. By contrast, men are largely unaffected by framing differences.

The results suggest that once effort is to be exerted to prevent some kind of loss, e.g. because a firm is facing losses, adding a competitive aspect may indeed increase the performance of women.

2 Experimental Design and Procedures

The experiment was conducted using pen and paper at the end of undergraduate lectures at the University of Rostock in April 2025. After the respective lecture, students were informed about the possibility to participate in a research study and otherwise offered to leave. Those who stayed were asked to slightly separate and not to talk during the experiment (there were always two research assistants present to monitor subjects); in all lectures, participants were of both genders.

The experiment entailed four settings referred to as two treatments (with and without competition) which are both presented using two frames (gain and loss); assignment to experimental conditions was random. In all cases, subjects received a sheet of paper with 50 rows of pseudo-randomised sequences of numbers between 0 and 9. The main task was to circle all “1”s in a line and put the correct line count in a text box at the end of each line (cf. Schütze and Wichardt, 2025). This was either framed as a gain (i.e. gaining tokens for correct answers) or as preventing a loss (i.e. subjects were told that they had 200 tokens which would be lost if not saved – one token per correctly identified 1), resulting in equal payoffs for equal performance.

Moreover, all subjects were told that they would be assigned a random anonymous counterpart (see below). One treatment then entailed a additional competitive aspect, where acquiring more tokens than the other would earn another 100; in the non-competitive treatment 100 tokens were paid on top if a coin flip at the end would show heads (i.e. independent of performance). Subjects were informed about this prior to the effort task. Every 10th subject was paid as stated.¹ Tokens were converted to Euro at a rate of 1 token corresponding to 10 Cent.

After the effort task, subjects had to fill in a brief questionnaire asking, for example, about general risk attitude (cf; Dohmen et al., 2011; see also Lönnqvist et al., 2015), beliefs about performance and their (hypothetical) willingness to play a fair game in a gain and loss setting.

Everyone received two pages of instructions and a closed envelope not to be opened until asked to do so with the task sheet and the questionnaire to be answered at the end (1 page each). The first page of the instructions contained general information and information about payment. It was read aloud and concluded with a question about age and gender. The second page was more specific about the task and was to be read alone.

After subjects had read the instructions remaining questions were answered privately by the experimenters. Subjects had 3 minutes for the task, after which answer sheets had to be put back into envelopes and handed to the experimenters. Finally, subjects filled in the questionnaire. Once all material was collected, subjects to be paid were determined and payments made (competition partners were chosen randomly – within treatments – from the remaining pool to determine payments).

¹Charness et al., 2016, reviewing a significant amount of papers, find that paying for only a subset of periods or individuals is at least as effective as the pay all approach.

3 Results

217 subject participated in our study of which 216 are integrated into the analysis (50.7% female; mean age: 20,9, standard deviation 0,291).² Table 1 summarises average performance (correctly reported counts) by treatment conditions. Competitive treatments were oversampled as these were what we were primarily interested in.

	<i>N</i>	All	Female	Male
<i>Gain Non-Comp.</i>	38 (20/18)	70.47 (3.13)	79.22 (3.29)	62.60 (4.55)
<i>Loss Non-Comp.</i>	38 (23/15)	62.13 (4.01)	64.47 (8.36)	60.61 (3.91)
<i>Gain Comp.</i>	69 (29/40)	70.20 (2.78)	73.90 (3.54)	65.10 (4.42)
<i>Loss Comp.</i>	71 (34/37)	66.68 (2.72)	68.81 (3.91)	64.35 (3.80)

Table 1: Average performance by treatment and gender. Standard deviation in parentheses.

Overall, there are no significant treatment differences in outcomes, i.e. comparing gain and loss frames within treatments or different treatments for a given gain/loss frame (pairwise two-sided Mann-Whitney U tests, all $p \geq 0.1$).³ This also holds for both genders separately. However, in all treatments, average performance of females is better than that of males (cf. Table 2); this observation is compatible with earlier studies by Schütze and Wichardt (2025) and Krautwurm et al. (2026) and compatible with the subjects’ beliefs⁴ (Murad et al., 2019, find this effect for a comparable task).

	<i>N</i>	$\Delta(\mathbf{Female-Male})$
<i>Overall</i>	216	+8.35 ($p = 0.00$)
<i>Gain (Comp. + Non-Comp.)</i>	107	+11.47 ($p = 0.01$)
<i>Loss (Comp. + Non-Comp.)</i>	109	+4.72 ($p = 0.17$)
<i>Competition (Gain + Loss)</i>	140	+6.76 ($p = 0.09$)
<i>Non-Competition (Gain + Loss)</i>	76	+10.98 ($p = 0.01$)

Table 2: Gender differences overall and fixing one aspect; Mann-Whitney-U tests.

²1 person did neither specify gender nor age and was therefore excluded.

³R (Version: 2025.05.1+513) was used for statistical analysis.

⁴In all treatments, subjects on average believe women to perform better than men.

⁶Answers to gain and loss questions – willingness to accept a fair gamble in either frame – are used for classification according to relative valuations of gains ($Q\text{-Gain}$) and losses ($Q\text{-Loss}$); *Gain-seeking* takes the value one when ($Q\text{-Gain} > Q\text{-Loss}$), whereas *loss-averse* takes the value one when ($Q\text{-Gain} < Q\text{-Loss}$).

	Female			Male		
<i>Loss</i>	-14.76*** (1.047)	-15.68*** (2.363)	-16.86*** (3.287)	-1.99 (2.861)	-3.41 (4.655)	-2.52 (2.852)
<i>Comp</i>	-5.32** (2.237)	-4.07^ (2.547)	-5.62** (2.710)	+2.50 (5.636)	+1.60 (6.013)	+4.31 (5.473)
<i>Loss*Comp</i>	+9.67** (4.106)	+9.47* (4.847)	+11.01** (5.165)	+1.24 (7.589)	+3.37 (9.129)	-1.47 (9.098)
<i>gain-seeking</i>		-5.26** (2.477)	-5.24** (2.397)		-3.14 (2.867)	-1.65 (3.305)
<i>loss-averse</i>		-6.12 (5.030)	-4.41 (4.347)		+1.54 (4.379)	+0.43 (3.194)
<i>risk preference</i>		+3.06*** (0.327)	+2.16*** (0.503)		+1.30** (0.527)	+1.00 (0.653)
Δ belief			+0.41*** (0.071)			+0.56*** (0.113)
Constant	79.22*** (1.831)	64.59*** (4.069)	72.25*** (3.556)	62.60*** (4.219)	55.06*** (5.592)	57.99*** (5.004)
Number of observations	110	110	101	106	105	102
R-squared	0.0383	0.1281	0.1904	0.0064	0.0412	0.1464

Table 3: Linear regressions for female and male subjects. Gain/loss seeking are binary variables;⁶ Δ belief=belief own performance - belief partner's performance. One missing male observation for gain-seeking and loss-averse; 9/4 missing female/male observations for Δ belief. Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, ^ indicates $p = 0.11$ (for transparency only).

Additional regression analyses with standard errors clustered at the session level show that (only) women are strongly affected by treatment variations (cf. Table 3). As Table 3 shows, both framing the task as a loss and adding competition have a substantial negative and statistically significant impact on performance by women, loss framing reducing performance by 23% (roughly 7% for competition – referring to values from model 3 in relation to the constant from as reference category). However, the interaction of both, i.e. once the loss frame is combined with a competitive aspect, shows a highly positive effect on performance of women (roughly 15% increase). While not outweighing the effect of the loss framing, the data suggest that once effort is about preventing a loss, adding a competitive aspect may be worthwhile to increase overall performance – as men seem to react neutrally (present setting) or positive to competition (e.g. Gneezy et al., 2003). In addition, it is noteworthy that a higher willingness to take risks has a substantial positive effect on performance especially for woman; for women we also find a negative correlation of being more gain-seeking

with performance.⁷

4 Concluding Remarks

The experimental data reported in this paper show that men and women react differently to variations in the framing of a real effort task as either having a competitive aspect or not and effort being exerted to create a gain or prevent a loss. While men are essentially unaffected by different frames, women show a clear drop in performance for loss settings. Moreover, similar to earlier findings (e.g. Gneezy et al., 2003), only women react negatively to competition in the present setting. The combined effect, however, is positive, i.e. women perform better in a loss setting if this has a competitive aspect. Thus, despite the often negative effects of competition on performance by women (e.g. Gneezy, 2003; Ors et al., 2013), our data suggest that once effort is needed to prevent a loss, e.g. workers/managers having to prevent lay-offs through performance, adding a competitive aspect may actually increase performance.

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⁷We also estimate a pooled specification including the interaction Female x Loss x Competition. The coefficient on this term specifically measures whether the positive interaction between loss framing and competition observed for women is significantly different from the corresponding interaction for men. The coefficient has the expected positive sign but is not statistically significant ($p=0.17$). Due to the number of observations, the sample provides limited power for detecting a three-way interaction, though.

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