

Do women give up competing more easily? Evidence from the lab and the Dutch Math Olympiad*

Thomas Buser and Huaiping Yuan[†]

July 6, 2018

Abstract

We use lab experiments and field data from the Dutch Math Olympiad to show that women are more likely than men to stop competing if they lose. In a math competition in the lab, women are much less likely than men to choose competition again after losing in the first round. In the Math Olympiad, girls, but not boys, who fail to make the second round are less likely to compete again one year later. This gender difference in the reaction to competition outcomes may help to explain why fewer women make it to the top in business and academia.

JEL: C91, D03, J01, J16

Keywords: willingness to compete, gender, career decisions, lab experiment, regression discontinuity

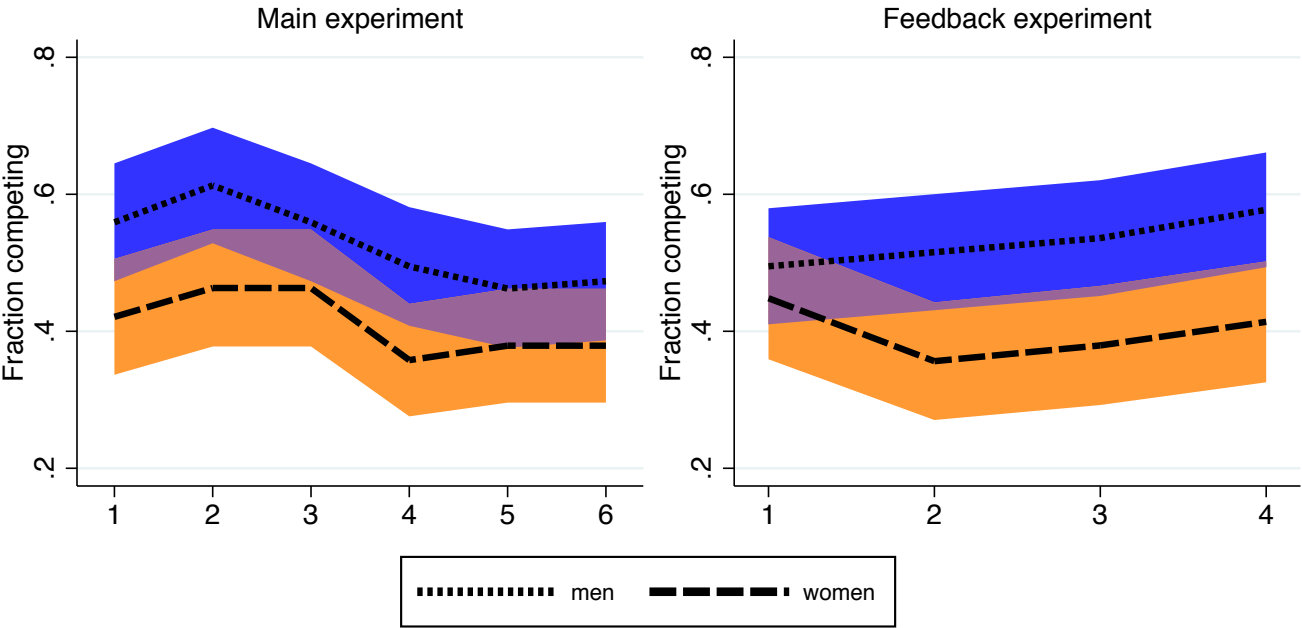
*We would like to thank seminar and workshop participants in Amsterdam, Bilbao, Cologne, Hong Kong, Leuven, Maastricht, Munich, San Francisco, São Paulo, Stanford, Tel Aviv, Tilburg, Vienna, and Zürich for useful comments. Thomas Buser gratefully acknowledges financial support from the Netherlands Organisation for Scientific Research (NWO) through a personal Veni grant and we would like to thank CREED for letting us use their lab.

[†]Buser: University of Amsterdam and Tinbergen Institute. t.buser@uva.nl. School of Economics, Roetersstraat 11, 1018WB Amsterdam, The Netherlands. Yuan: University of Amsterdam.

Online appendix

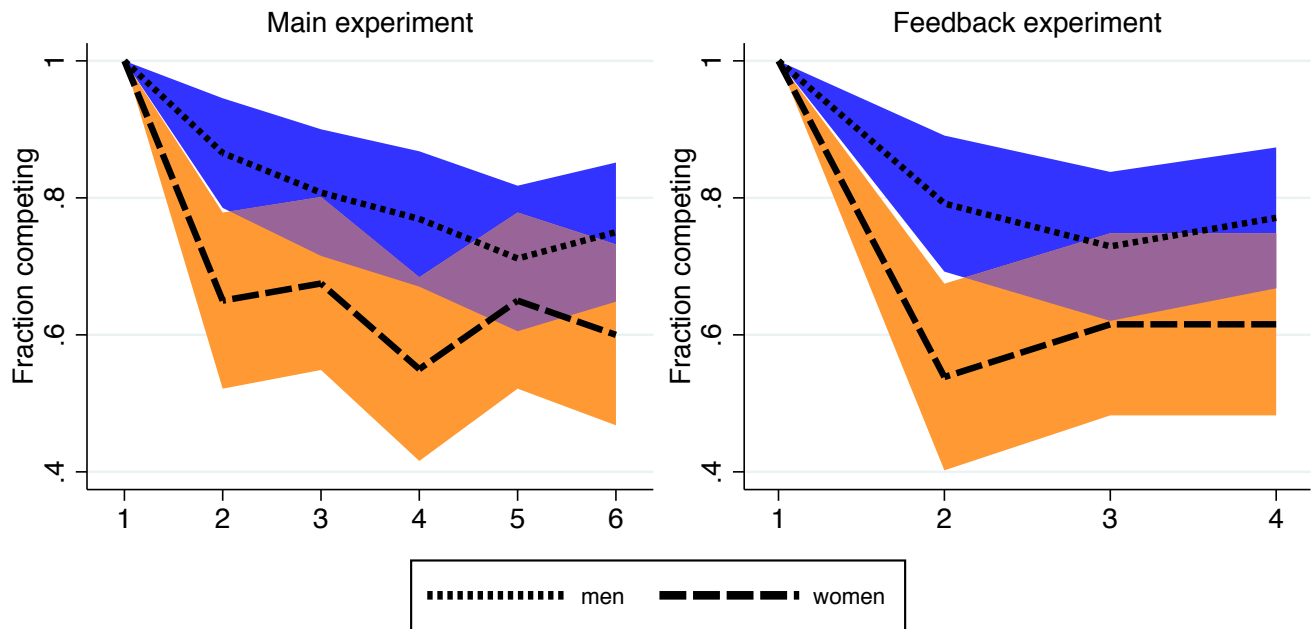
Raw gender gap in willingness to compete over the rounds

Figure A1: Willingness to compete by gender and round



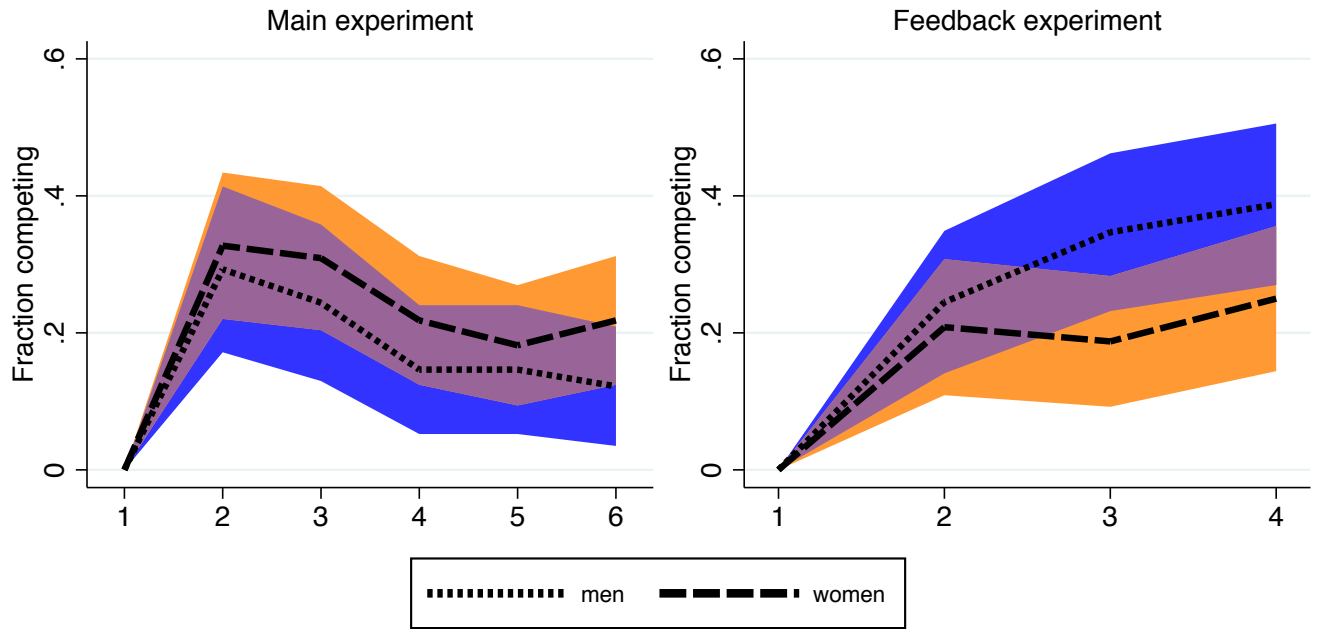
Note: Shaded areas represent 90-percent confidence intervals. The main experiment consisted of 6 rounds of 3 minutes each and the feedback experiment consisted of 4 rounds of 4 minutes each.

Figure A2: Willingness to compete by gender and round (participants who choose competition in round 1)



Note: Shaded areas represent 90-percent confidence intervals. The sample consists of those participants who choose competition in round 1. Main experiment: N=92 (40 women and 52 men). Feedback experiment: N=87 (39 women and 48 men). The main experiment consisted of 6 rounds of 3 minutes each and the feedback experiment consisted of 4 rounds of 4 minutes each.

Figure A3: Willingness to compete by gender and round (participants who choose piece rate in round 1)



Note: Shaded areas represent 90-percent confidence intervals. The sample consists of those participants who choose piece rate in round 1. Main experiment: N=96 (55 women and 41 men). Feedback experiment: N=97 (48 women and 49 men). The main experiment consisted of 6 rounds of 3 minutes each and the feedback experiment consisted of 4 rounds of 4 minutes each.

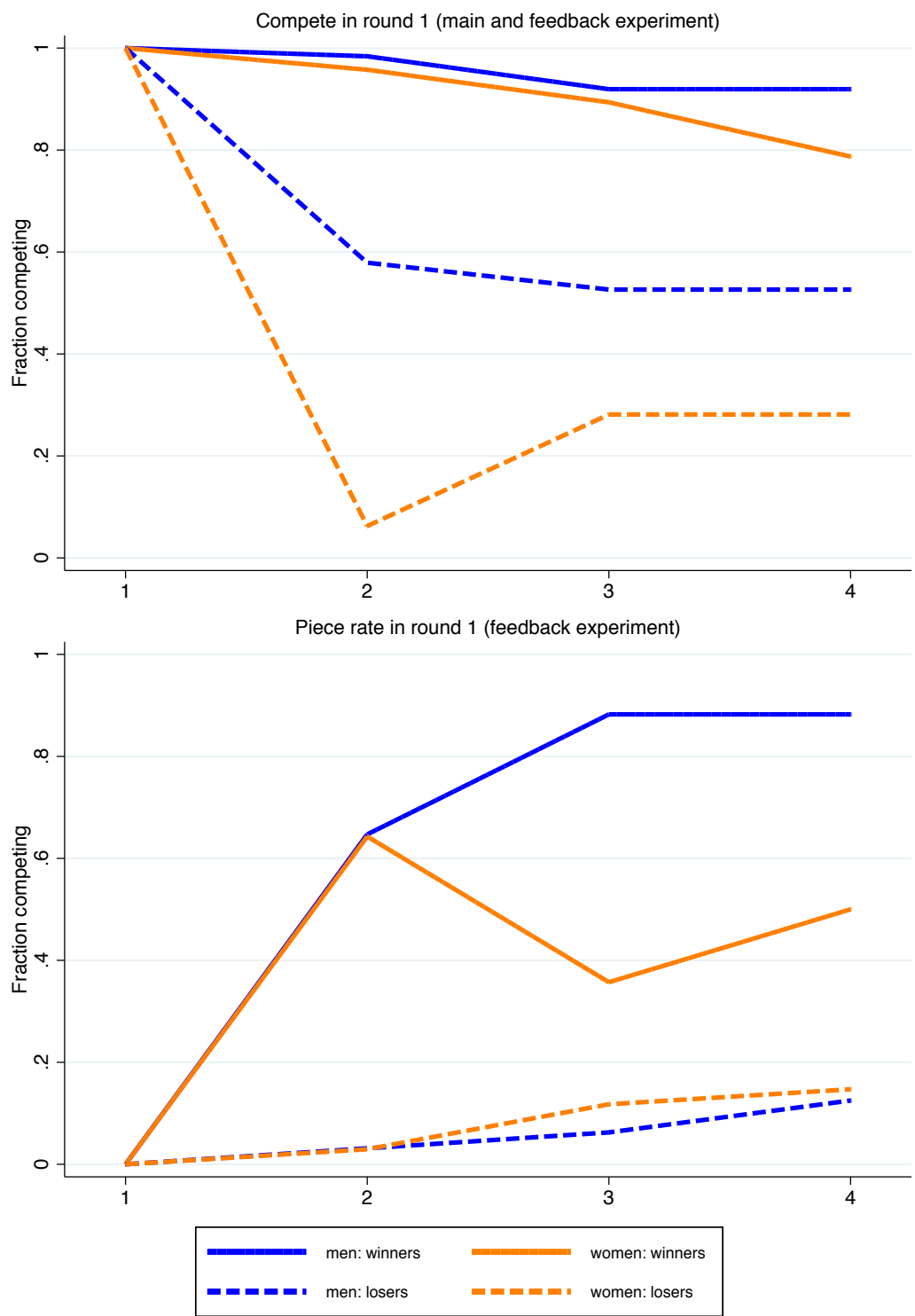
Interacted models

Table A1: Difference of the effect of the round 1 outcome on subsequent choices across experiments

	(1)		(2)
Competition in round 1		Piece rate in round 1	
Female	-0.065 (0.056)	Female	0.001 (0.062)
Round 1 loser	-0.240* (0.127)	Round 1 winner/top	0.004 (0.166)
Female \times loser	-0.349** (0.145)	Female \times winner/top	0.167 (0.143)
Female \times feedback	0.037 (0.091)	Female \times feedback	0.028 (0.079)
Round 1 loser \times feedback	-0.045 (0.176)	Round 1 winner/top \times feedback	0.560*** (0.189)
Female \times loser \times feedback	0.076 (0.192)	Female \times winner/top \times feedback	-0.454** (0.183)
Score fixed effects	\checkmark		\checkmark
Round 1 rank	\checkmark		\checkmark
Observations	721		771
Individuals	179		193

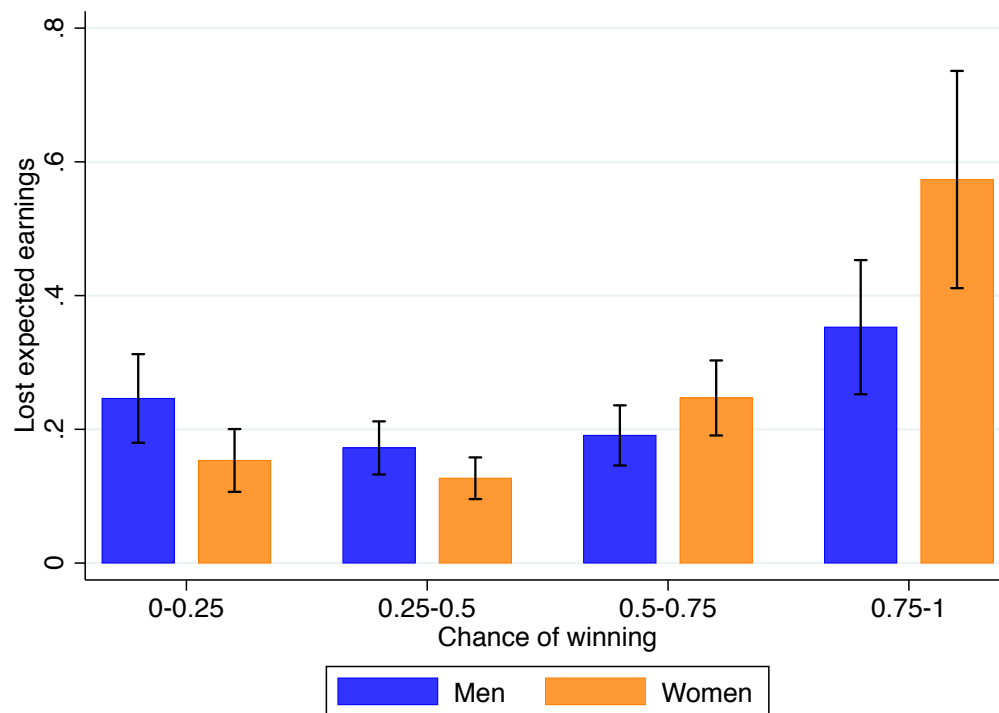
Choices over the rounds by gender and competition outcome in round 1

Figure A4: Willingness to compete by gender, round and competition outcome in round 1



Gender difference in expected forgone earnings

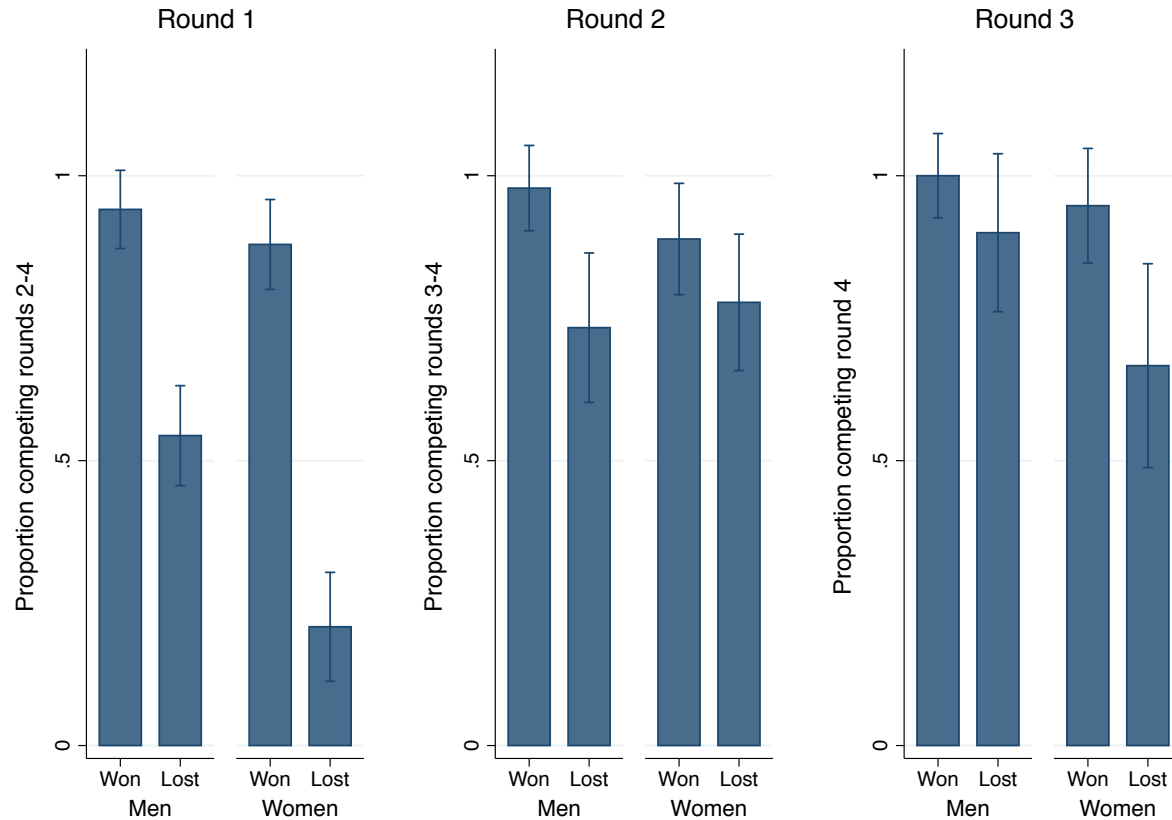
Figure A5: Average lost earnings over all rounds by gender and relative performance



Note: The graph shows average lost earnings relative to the expected earnings resulting from the optimal choice given performance. Pooled sample from the main and feedback experiments (rounds 2 to 4). Error bars represent 90% confidence intervals.

Effect of competition outcomes in later rounds

Figure A6: Average number of times competition is chosen in subsequent rounds by gender and competition outcome in each round (pooled sample)



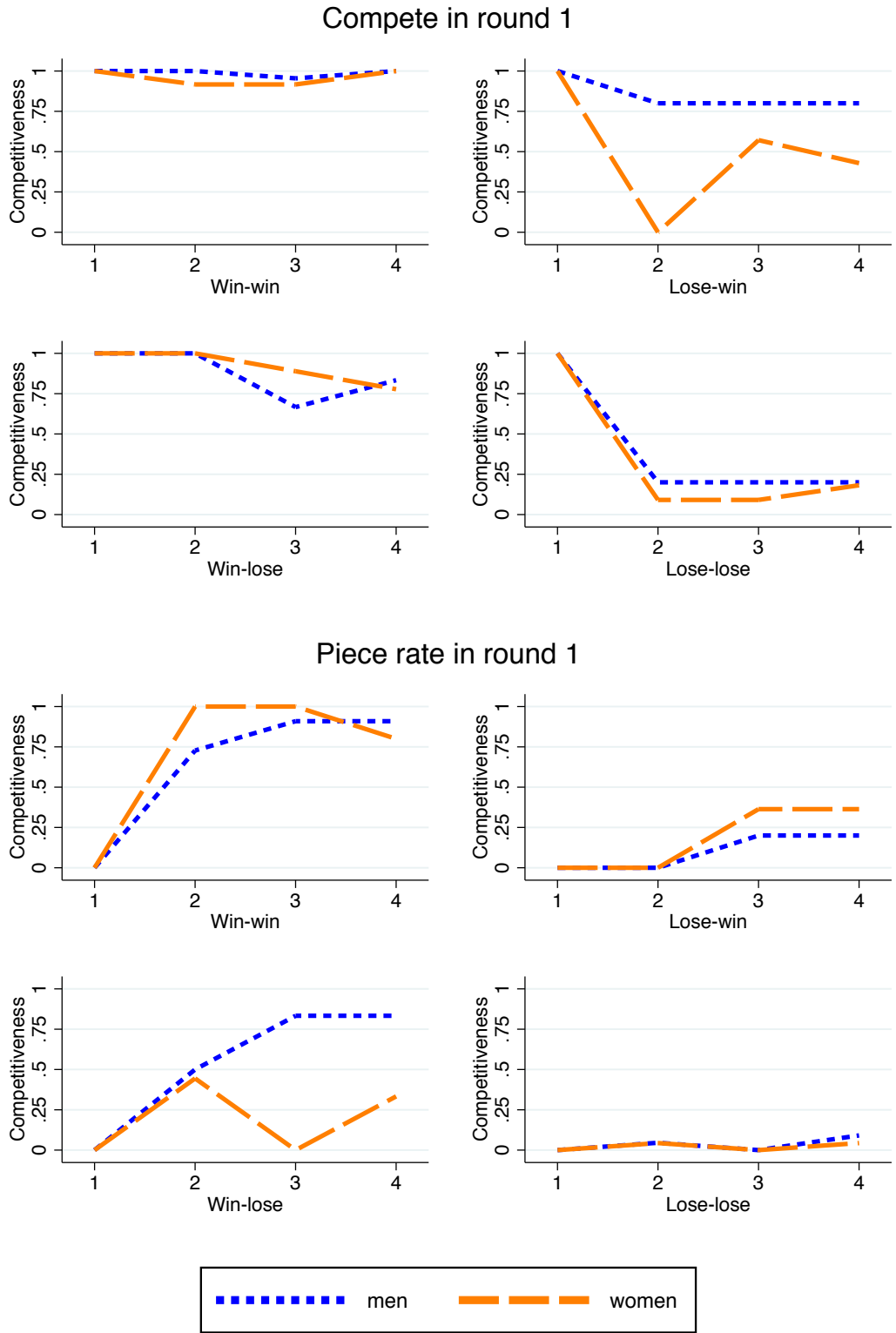
Note: The sample in each subgraph consists of participants who competed and won in all previous rounds. The bars show the average number of times that participants chose to compete over the subsequent rounds using the pooled sample from the main and feedback experiments (rounds 2 to 4). Error bars represent 90% confidence intervals.

Table A2: Effect of competition outcomes in each round on subsequent competition entry

	(1)	(2)	(3)	(4)	(5)	(6)
	Round 1		Round 2		Round 3	
	All	Top	All	Top	All	Top
Female	-0.064 (0.058)	-0.099* (0.053)	-0.060 (0.068)	-0.096 (0.067)	0.015 (0.075)	-0.001 (0.048)
Loser	-0.245*** (0.074)	-0.145* (0.080)	-0.183** (0.091)	-0.155* (0.092)	-0.032 (0.098)	0.045 (0.073)
Female \times loser	-0.337*** (0.094)	-0.383*** (0.107)	0.111 (0.120)	0.139 (0.134)	-0.242* (0.140)	-0.305*** (0.105)
Score FE	✓	✓	✓	✓	✓	✓
Rank	✓	✓	✓	✓	✓	✓
N	179	114	106	86	70	60

Note: The table shows coefficients from OLS regressions of the average choice in subsequent rounds on a gender dummy, a dummy for having lost the competition and the interaction of the two. The sample in each column consists of participants who competed and won in all previous rounds. The sample is the pooled sample from the main and feedback experiments (rounds 2 to 4). The columns marked “Top” restrict the sample to participants who have a higher than 50 percent chance of winning based on their round 1 performance. Score fixed effects and rank mean score and normalised within-session rank in that particular round.

Figure A7: Choices over the rounds by choice in round 1 and by competition outcomes in rounds 1 and 2 (feedback experiment)



Beliefs and relative performance over the rounds by gender and competition outcome in round 1

Figure A8: Beliefs by gender, round and competition outcome in round 1

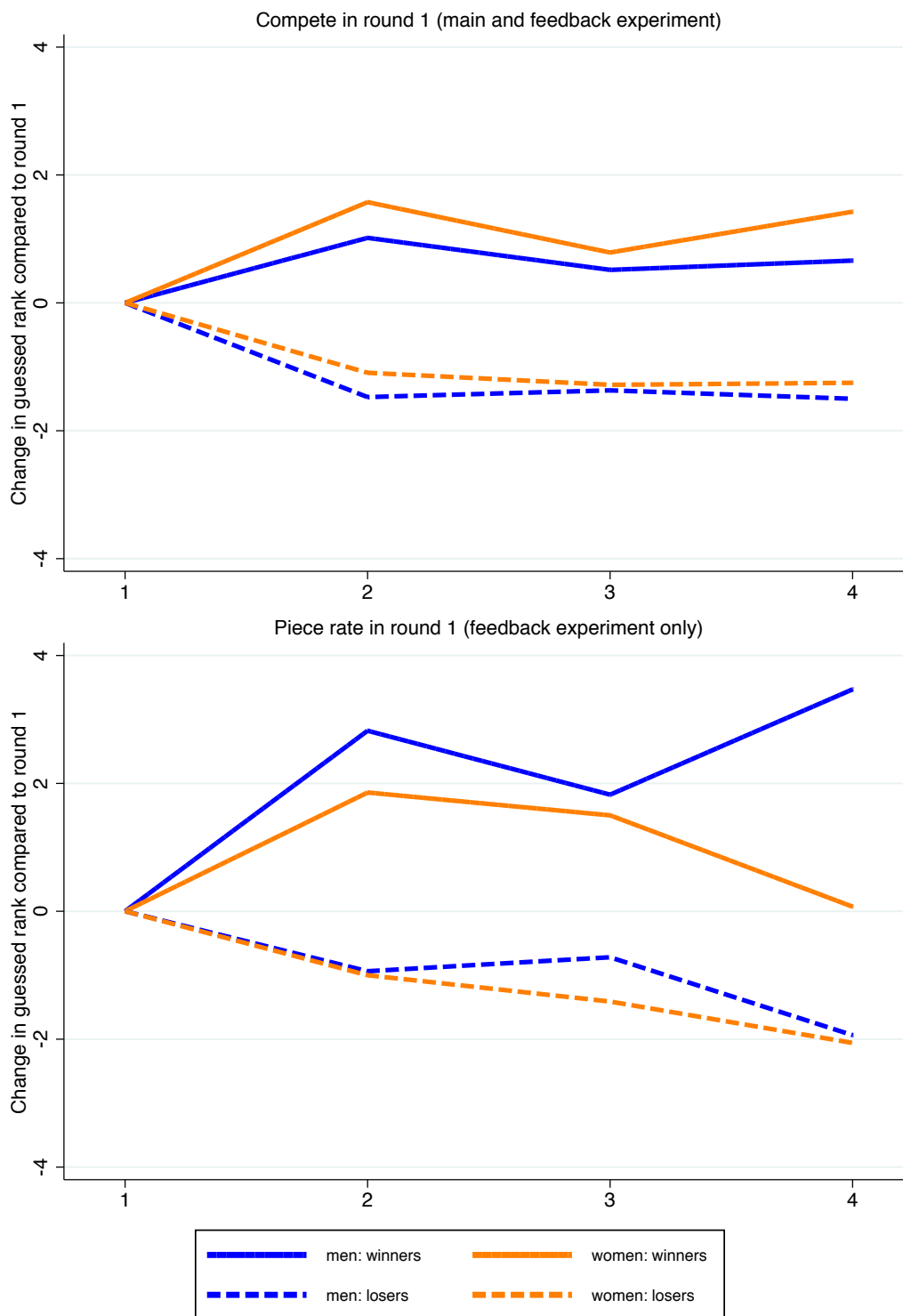
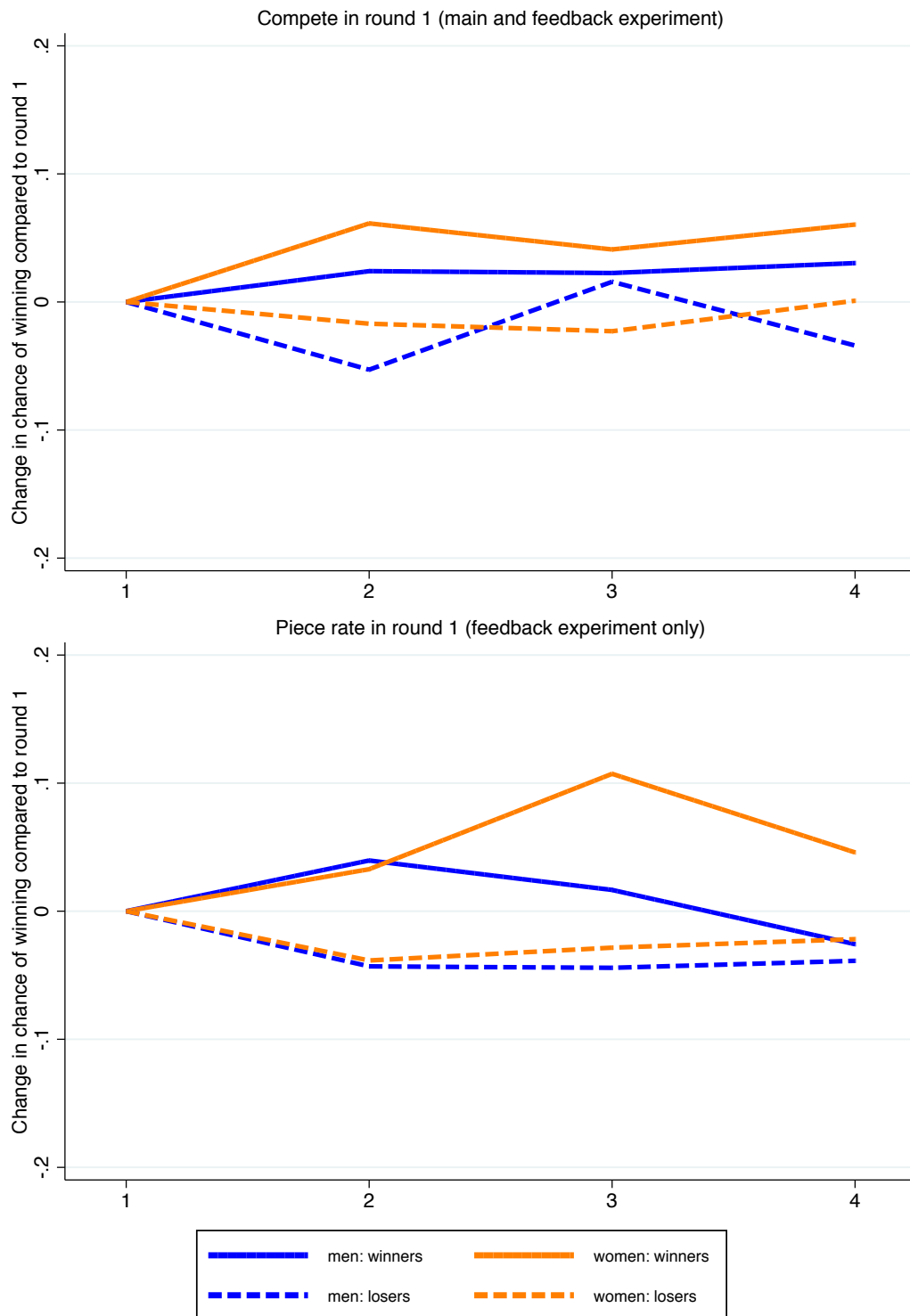


Figure A9: Rank by gender, round and competition outcome in round 1



Additional RD analyses

Table A3: Number of participants and winners per year

	2010	2011	2012	2013	2014
All participants:					
Participants	4150	5258	5612	7424	9161
Invited to 2nd round	696	799	817	801	1008
Participated in 2nd round	599	742	751	744	941
Sample:					
Participants	1534	1987	2054	2777	3239
Invited to 2nd round	252	290	310	275	312
Participated in 2nd round	219	262	282	256	285
Proportion female:					
Participants	0.33	0.37	0.34	0.38	0.40
Invited to 2nd round	0.28	0.28	0.22	0.26	0.31
Participated in 2nd round	0.28	0.28	0.22	0.26	0.29

Figure A10: Distribution of first-round scores by gender

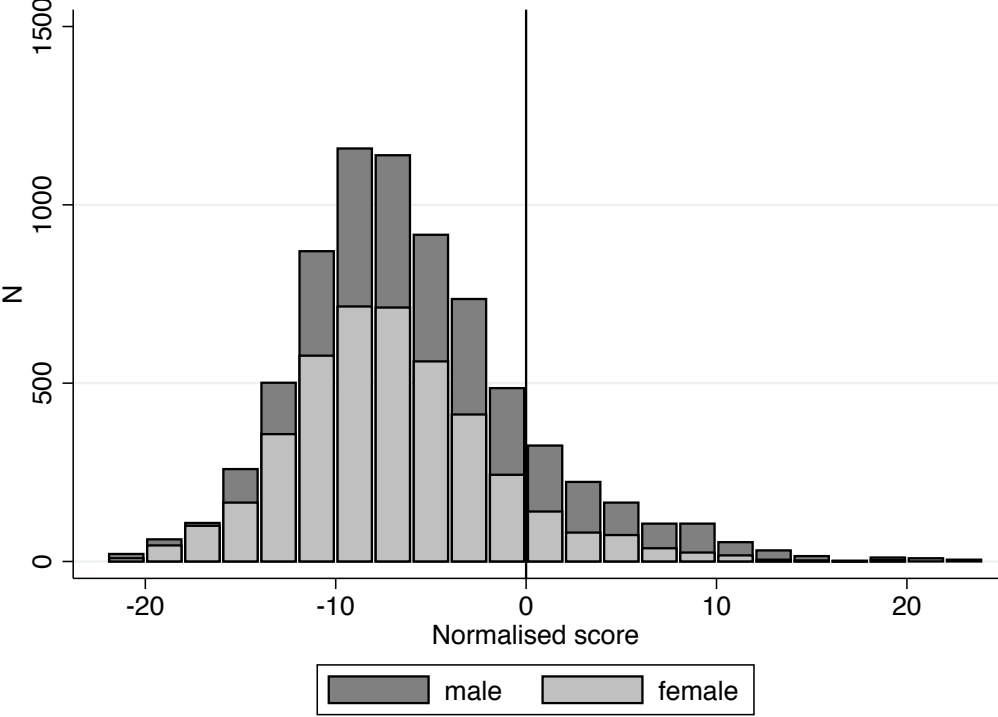
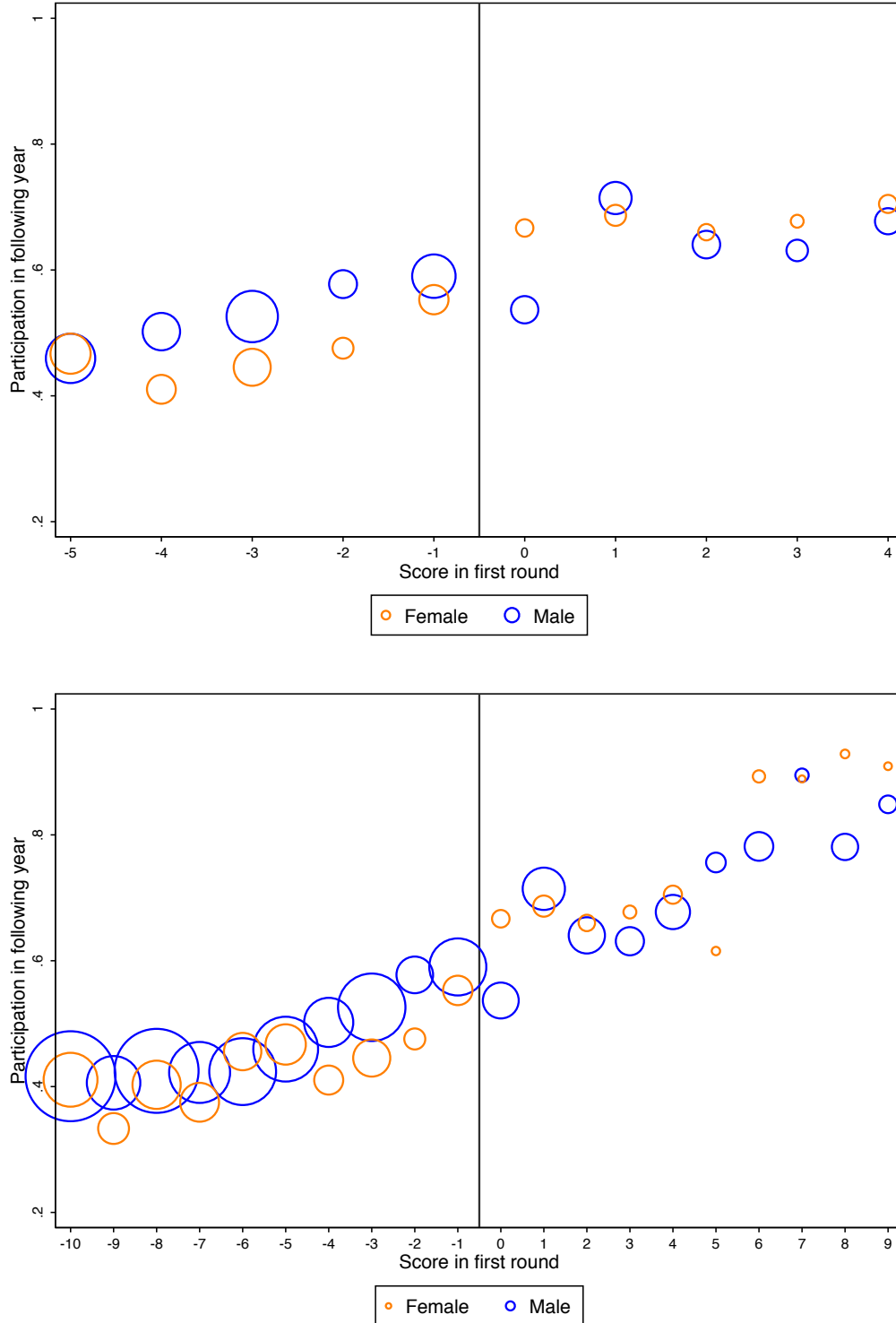
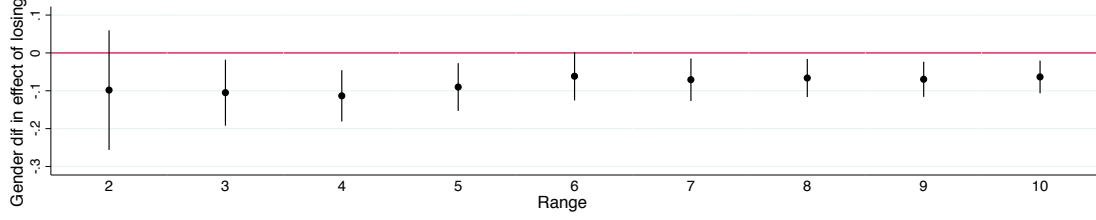


Figure A11: Regression discontinuity graphs without regression lines



Note: The x-axis shows the score in the first round of the Olympiad. Scores are normalised such that a score of 0 or higher means advancing to the second round. The y-axis shows the likelihood for participants in a certain bin to participate again in the first round one year later. The upper panel shows a scatter plot of observations within a range of 5 points of the cutoff separately for male and female participants. The lower panel shows a scatter plot of observations within a range of 10 points of the cutoff. The size of the markers is proportional to the amount of observations in that particular bin (score and gender).

Figure A12: Discontinuity estimates for varying bandwidths (dif-in-dif)



Note: Error bars represent 90% confidence intervals.

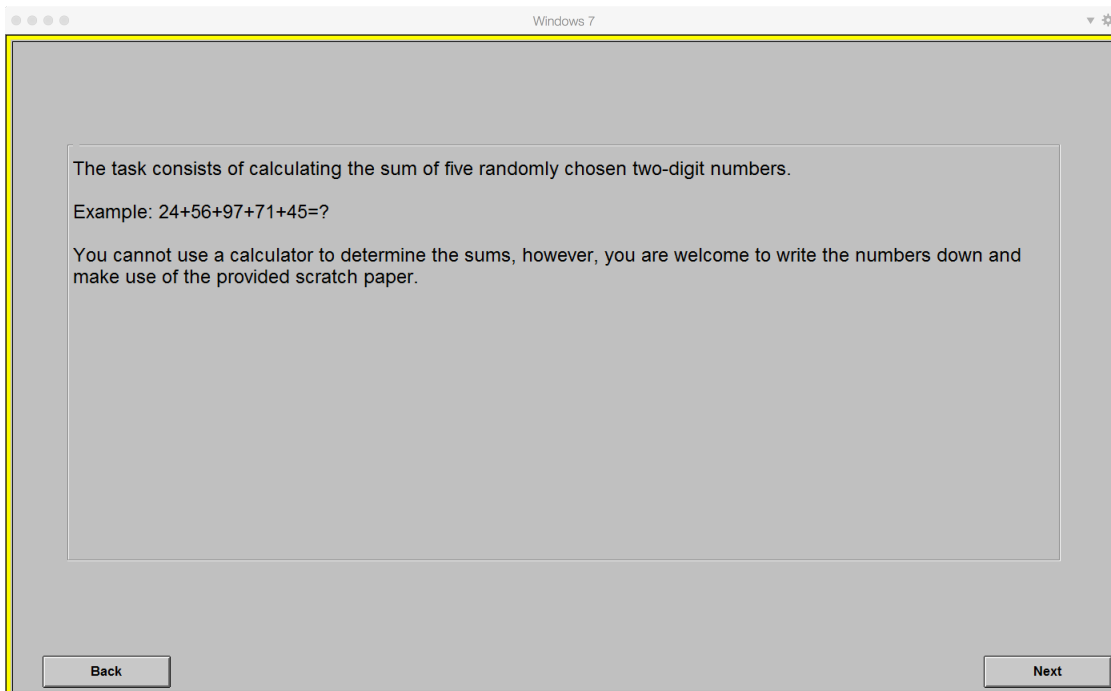
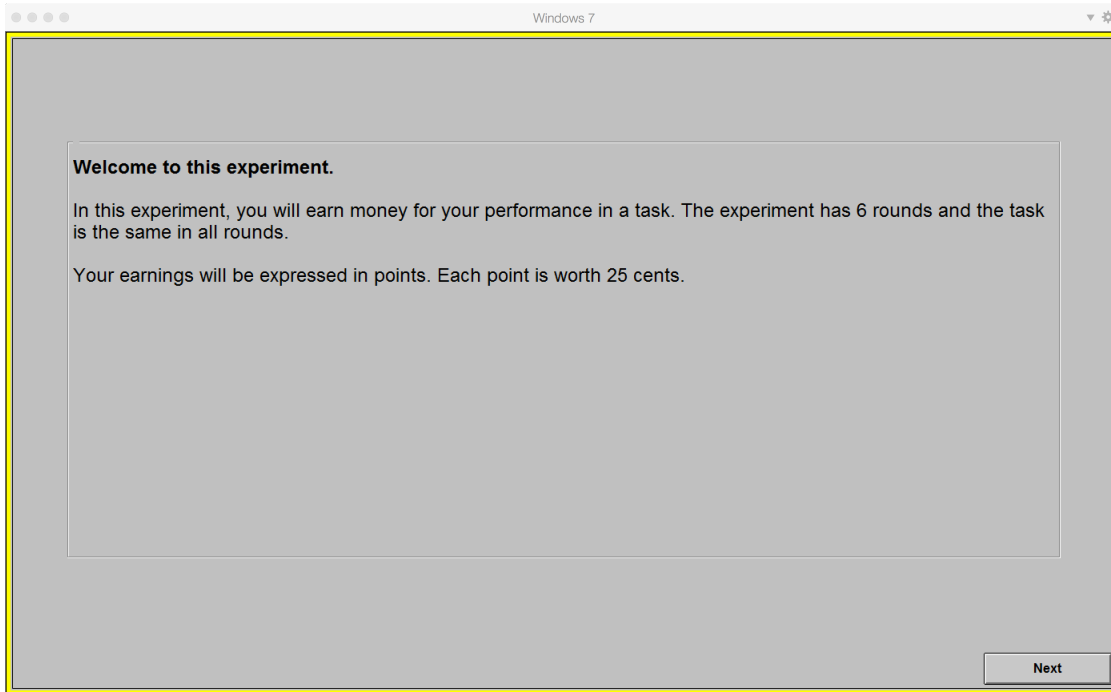
Table A4: Regression discontinuity results

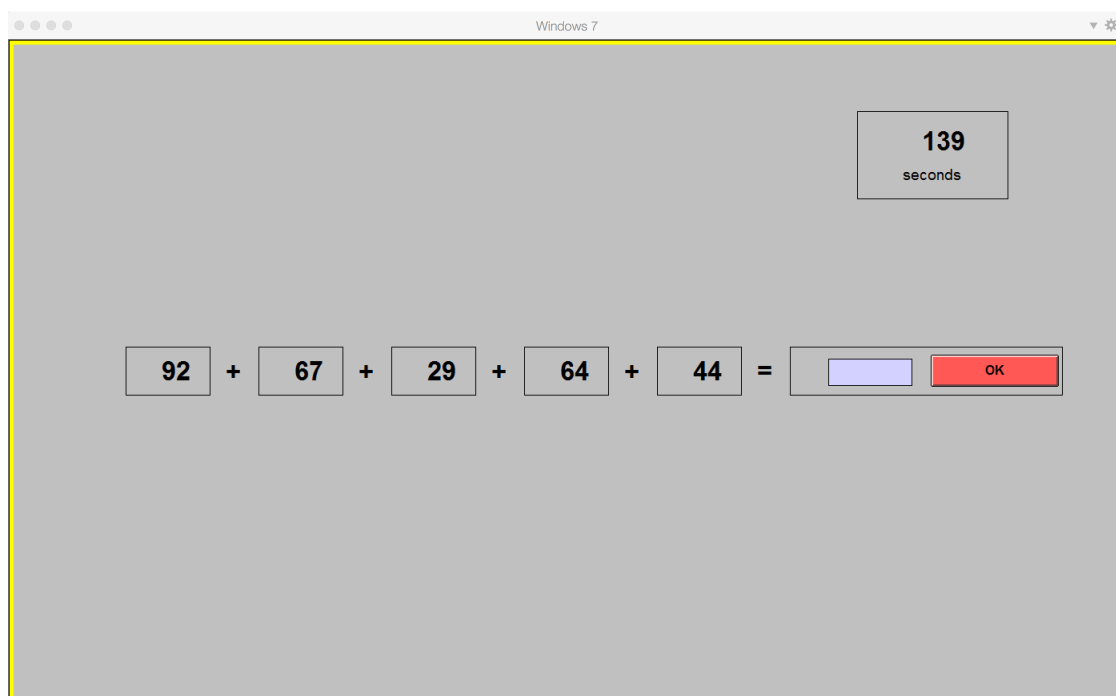
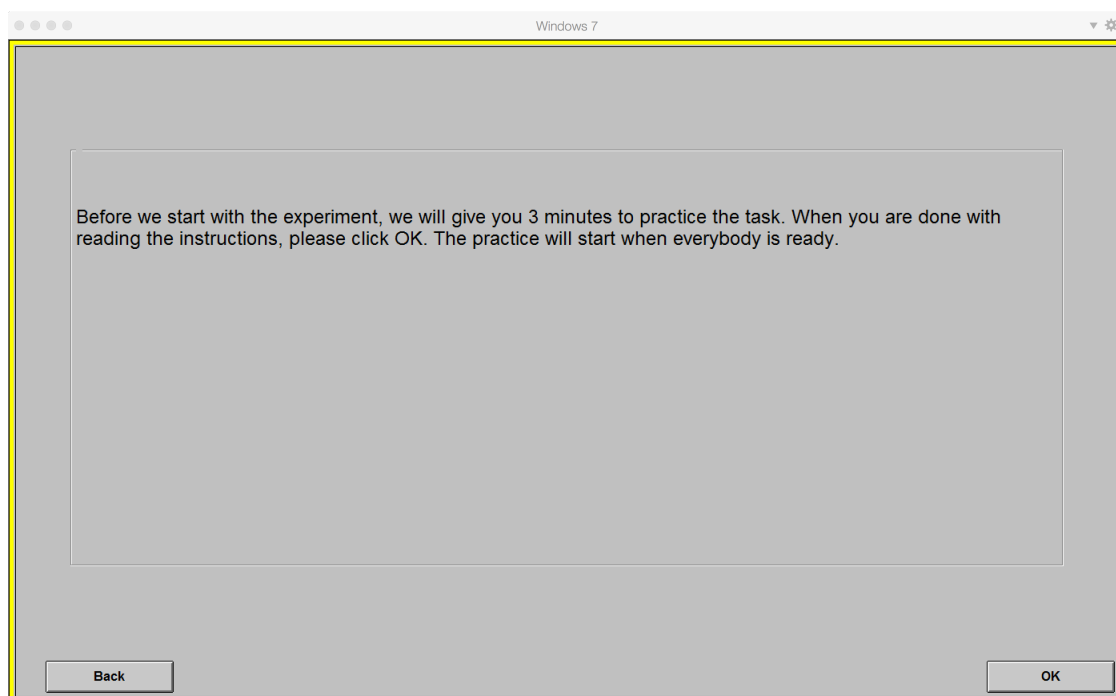
	(1)	(2)	(3)	(4)
Range (in points)	-/+ 4	-/+ 8	-/+ 11	-/+ 20
Dif-in-dif:				
Female	0.036 (0.034)	0.030 (0.024)	0.037 (0.022)	0.026 (0.021)
Lost	-0.094* (0.043)	-0.198*** (0.037)	-0.235*** (0.033)	-0.268*** (0.031)
Female \times lost	-0.113** (0.036)	-0.066** (0.029)	-0.070** (0.025)	-0.065*** (0.024)
First-order polynomial:				
Female	0.103 (0.167)	0.004 (0.095)	-0.055 (0.066)	-0.025 (0.062)
Lost	-0.011 (0.067)	-0.014 (0.052)	-0.045 (0.047)	-0.067 (0.040)
Female \times lost	-0.102 (0.066)	-0.123** (0.057)	-0.092* (0.053)	-0.085* (0.044)
Second-order polynomial:				
Female		0.043 (0.094)	0.002 (0.067)	-0.058 (0.066)
Lost		0.035 (0.068)	0.025 (0.057)	-0.013 (0.050)
Female \times lost		-0.181** (0.077)	-0.170** (0.063)	-0.127** (0.062)
N	2646	6356	8709	11545

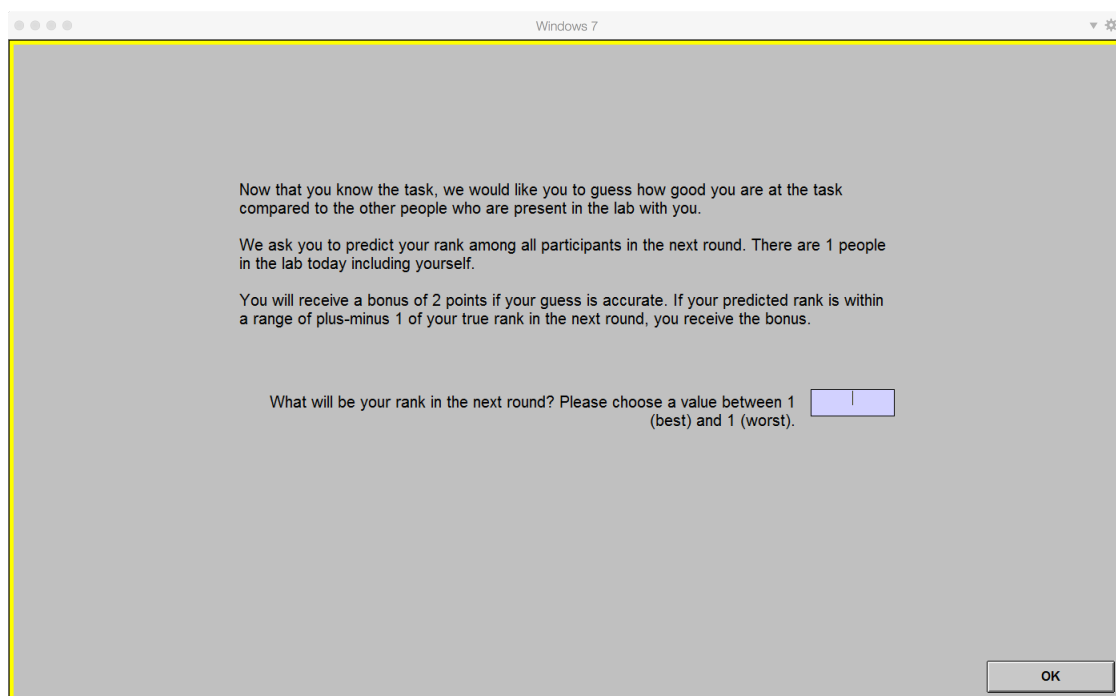
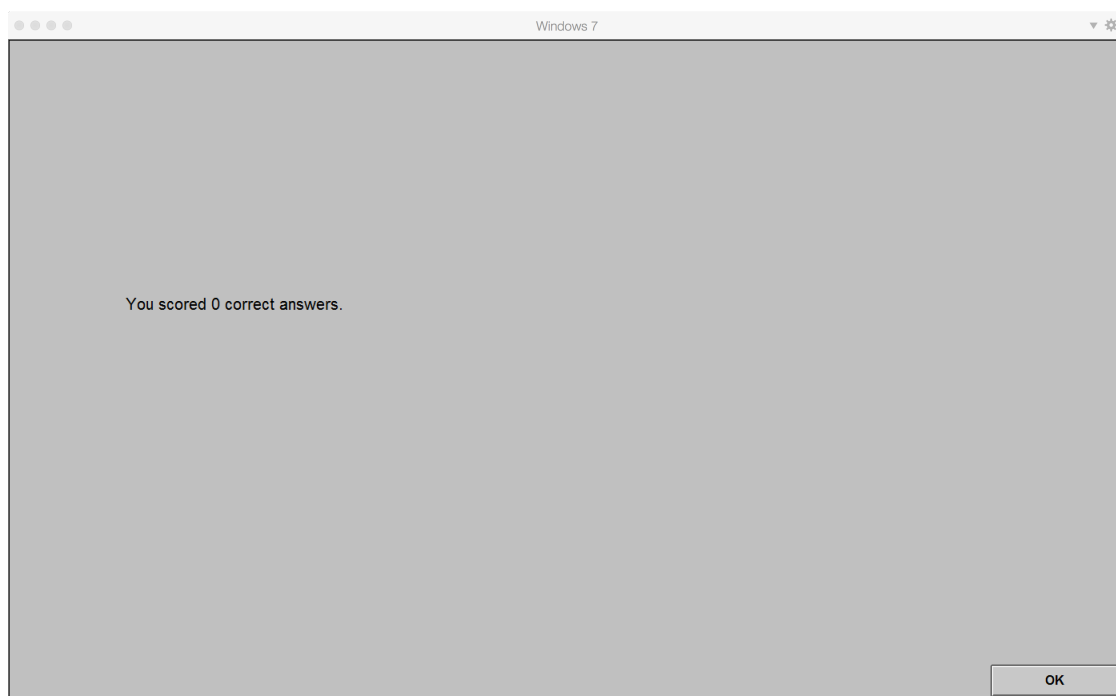
Note: The table shows coefficients from regressions of a binary indicator for participating again a year later on a female dummy, a dummy for not having made the second round (“lost”) and the interaction of the two. Range means the sample selection in terms of points left and right of the cutoff. First-order and second-order regressions also control for within-gender performance percentiles. Clustered standard errors in parentheses.

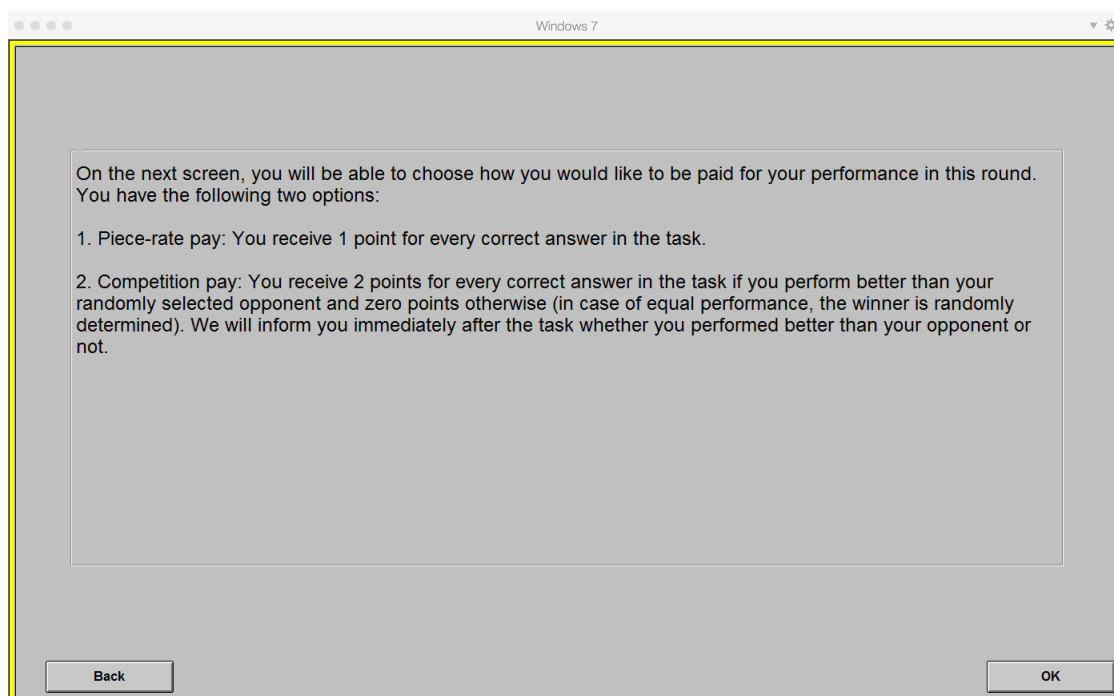
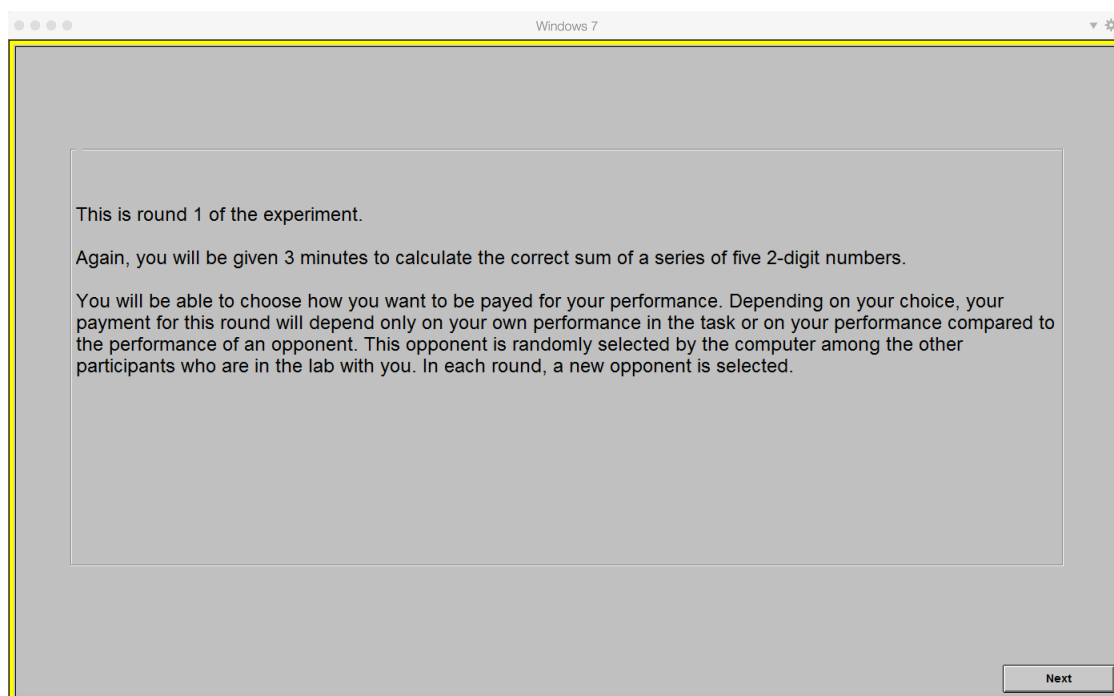
Online appendix: Experimental screenshots

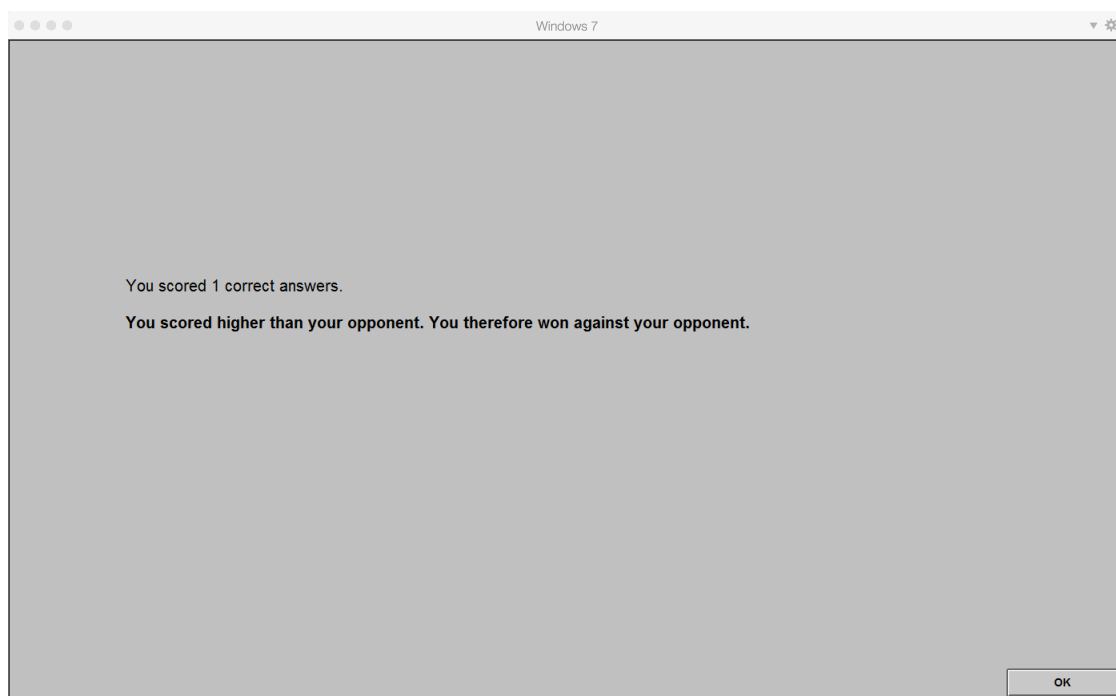
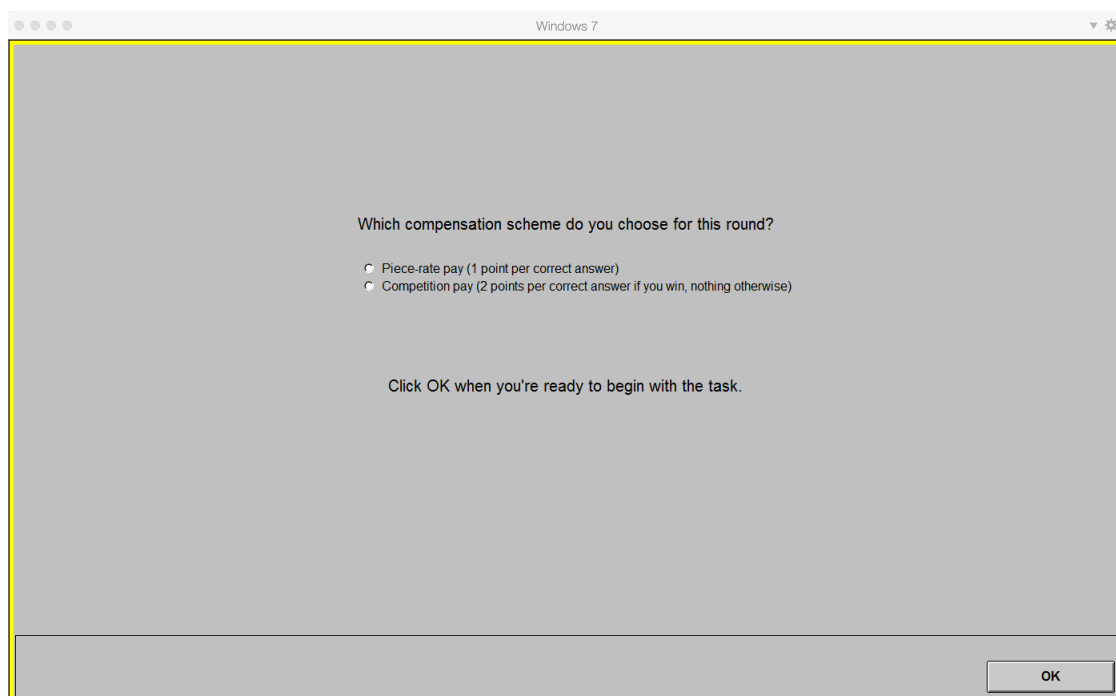
Main experiment

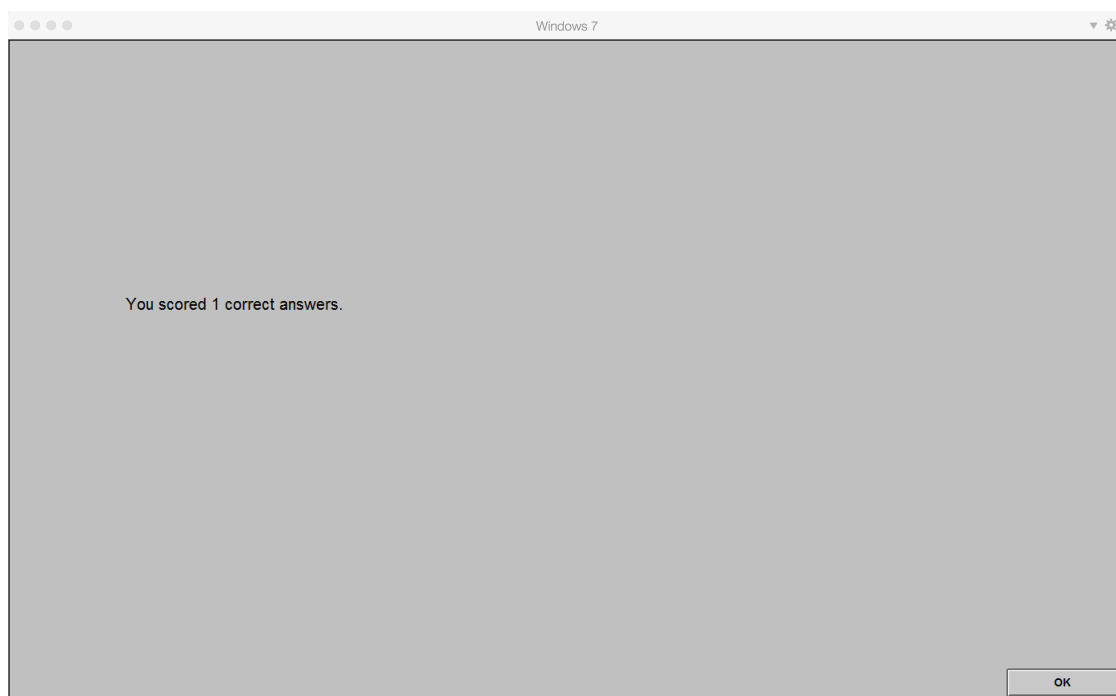
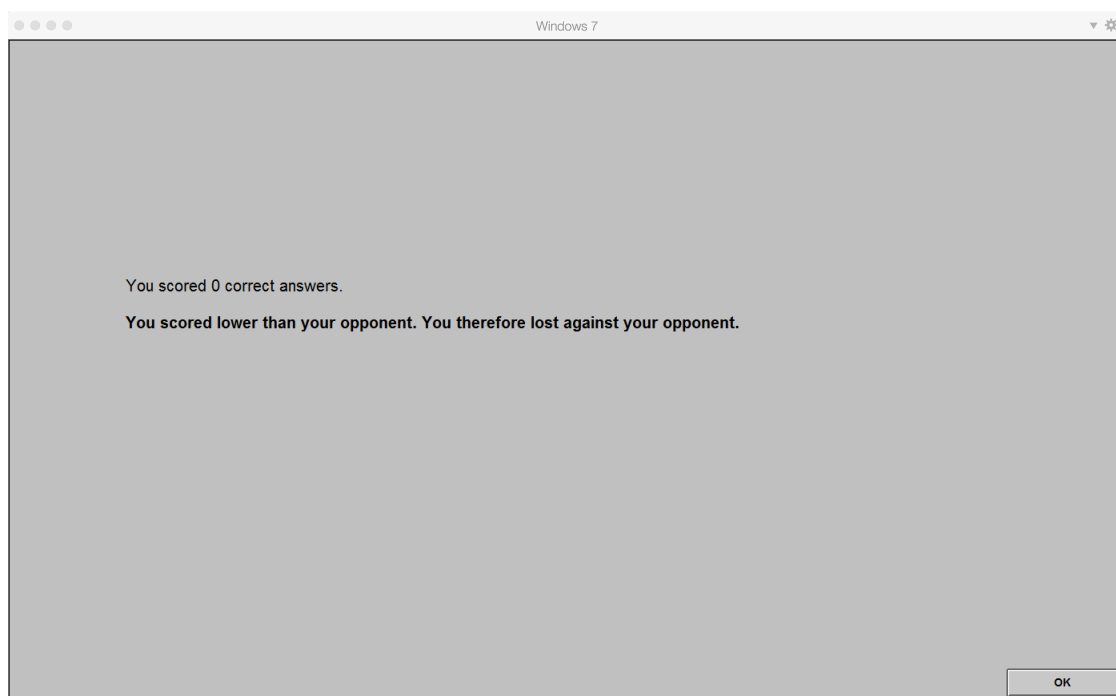


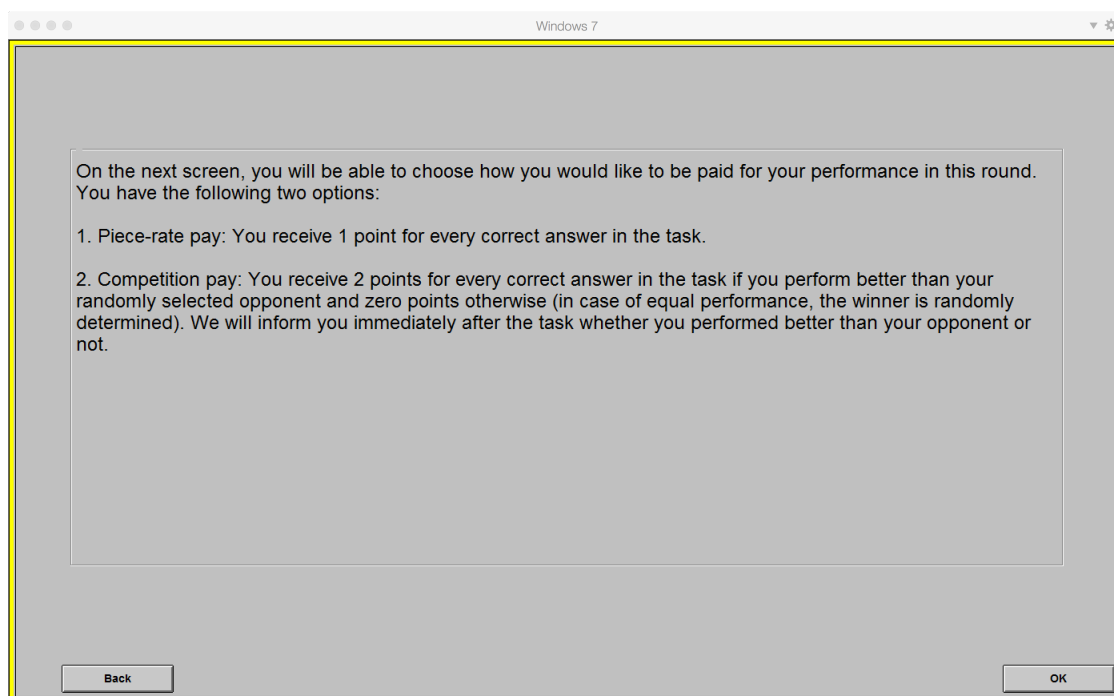
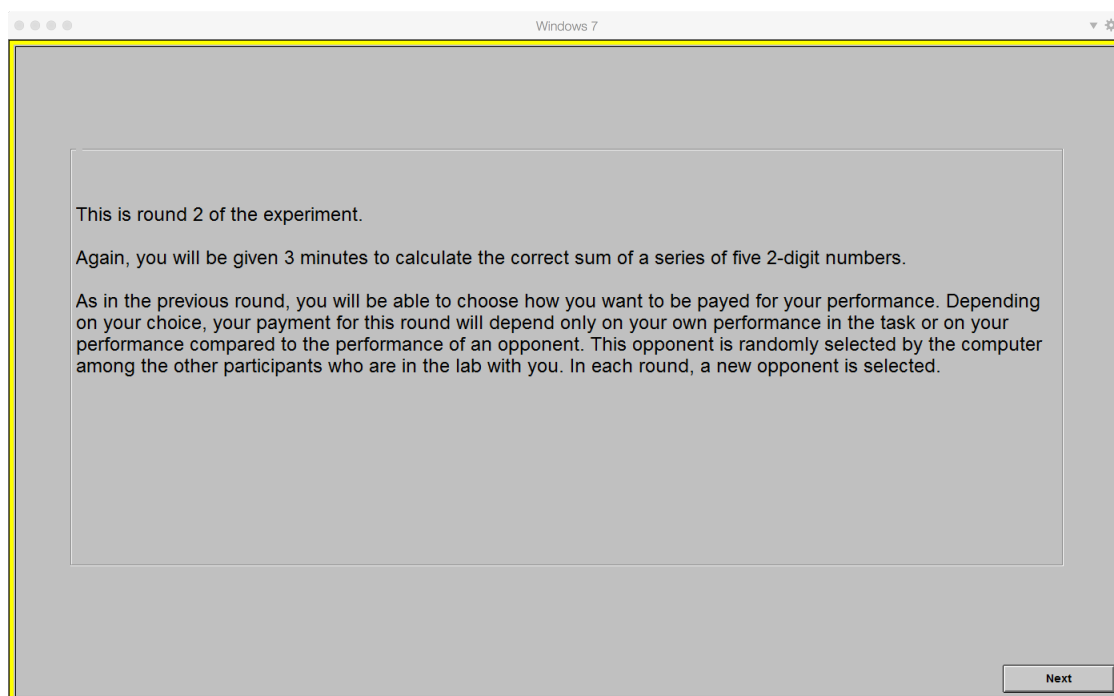












Windows 7

Which compensation scheme do you choose for this round?

☐ Piece-rate pay (1 point per correct answer)

☐ Competition pay (2 points per correct answer if you win, nothing otherwise)

Click OK when you're ready to begin with the task.

OK

Windows 7

Before we inform you of your earnings, we would like to ask you a few short questions.

What is your gender? ☐ Male ☒ Female

What is your age

OK

How do you see yourself: Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?

Please choose a value on the scale below, where the value 0 means "unwilling to take risks" and the value 10 means "fully prepared to take risk".

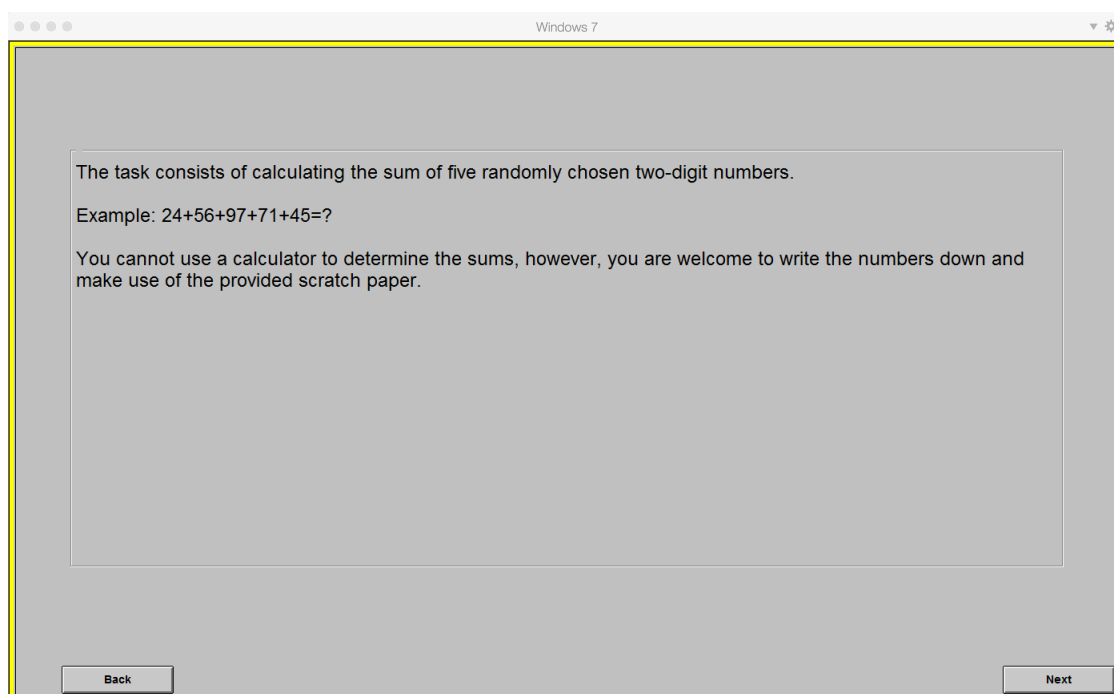
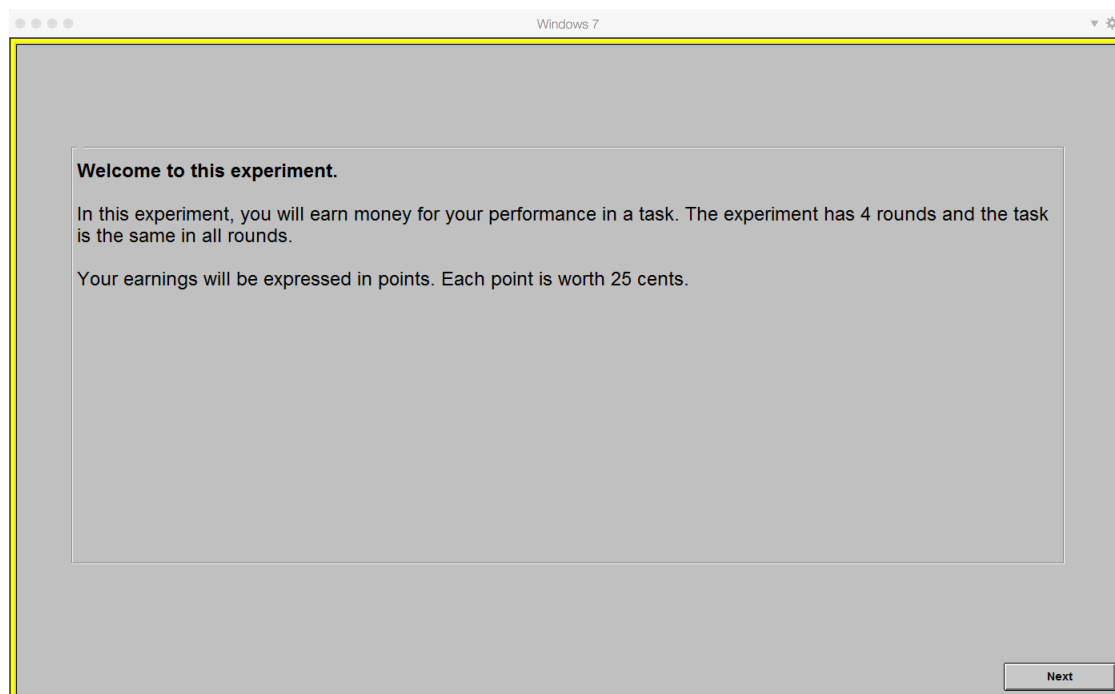
0=Unwilling to take risks ●●●●●●●●●● 10=Fully prepared to take risk

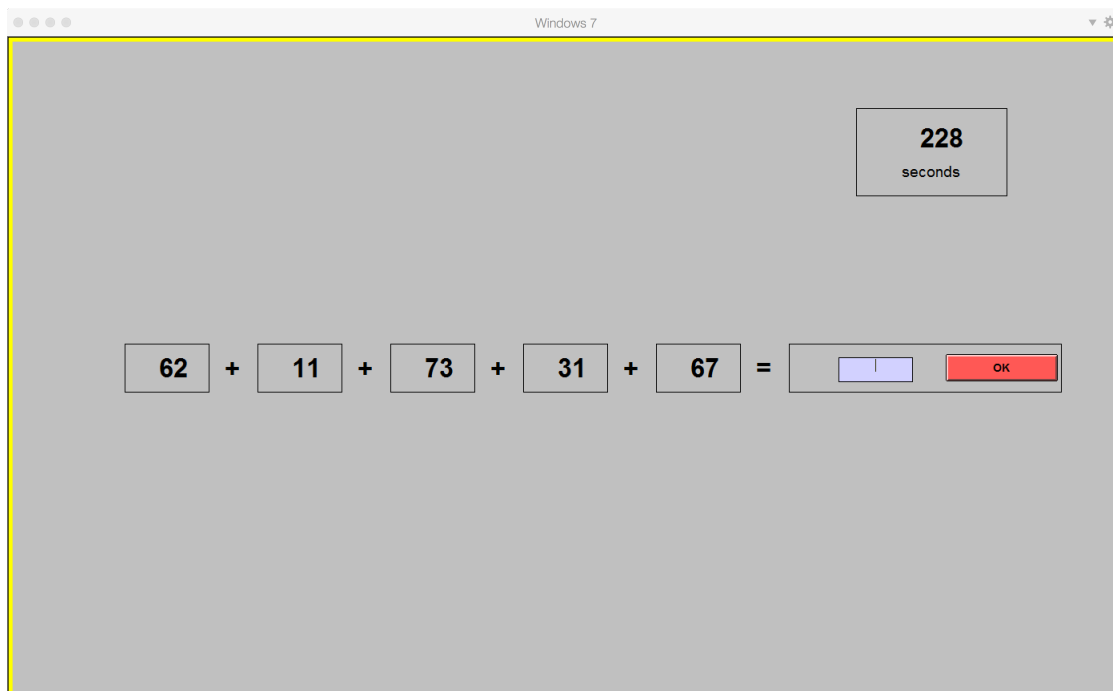
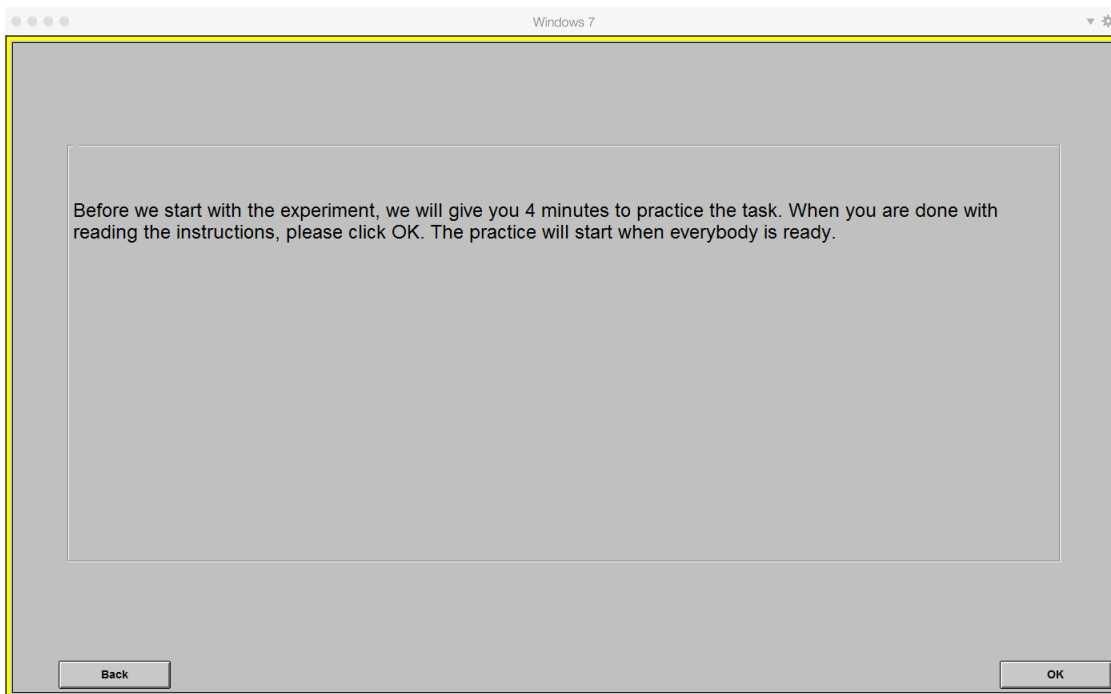
How competitive do you consider yourself to be?

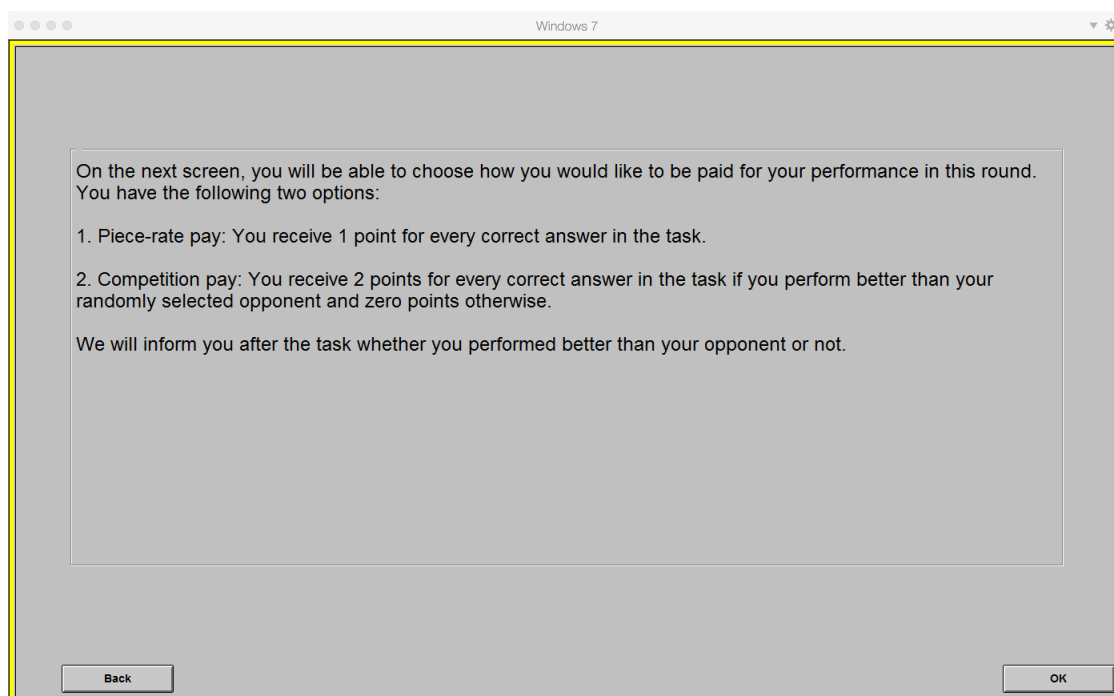
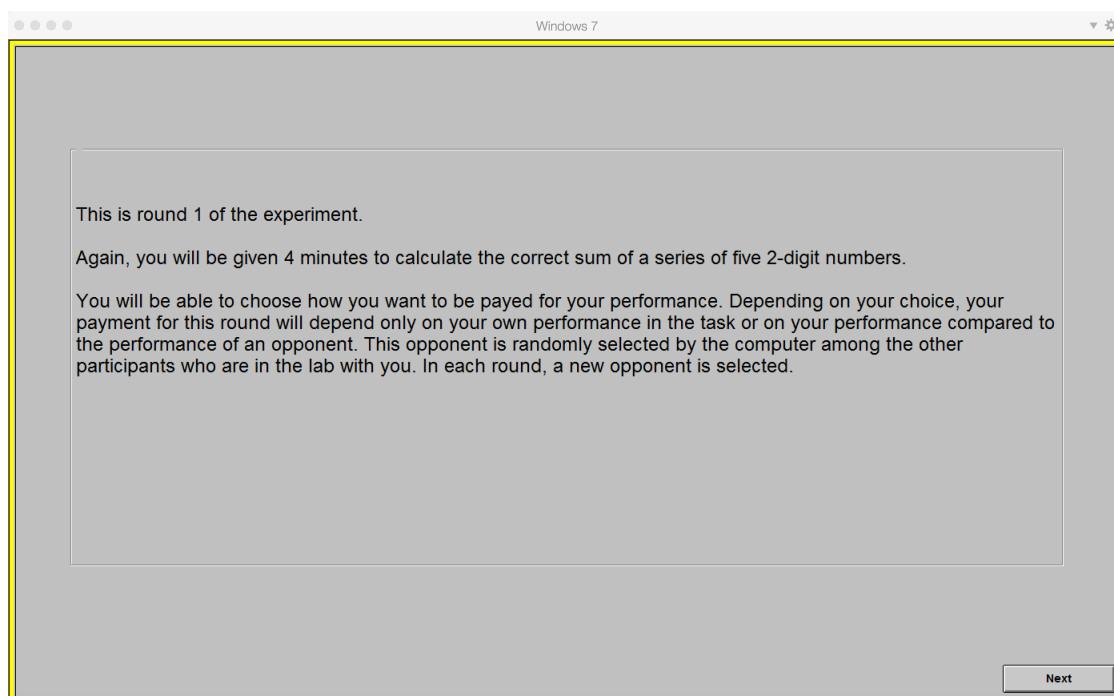
Please choose a value on the scale below, where the value 0 means "not competitive at all" and the value 10 means "very competitive".

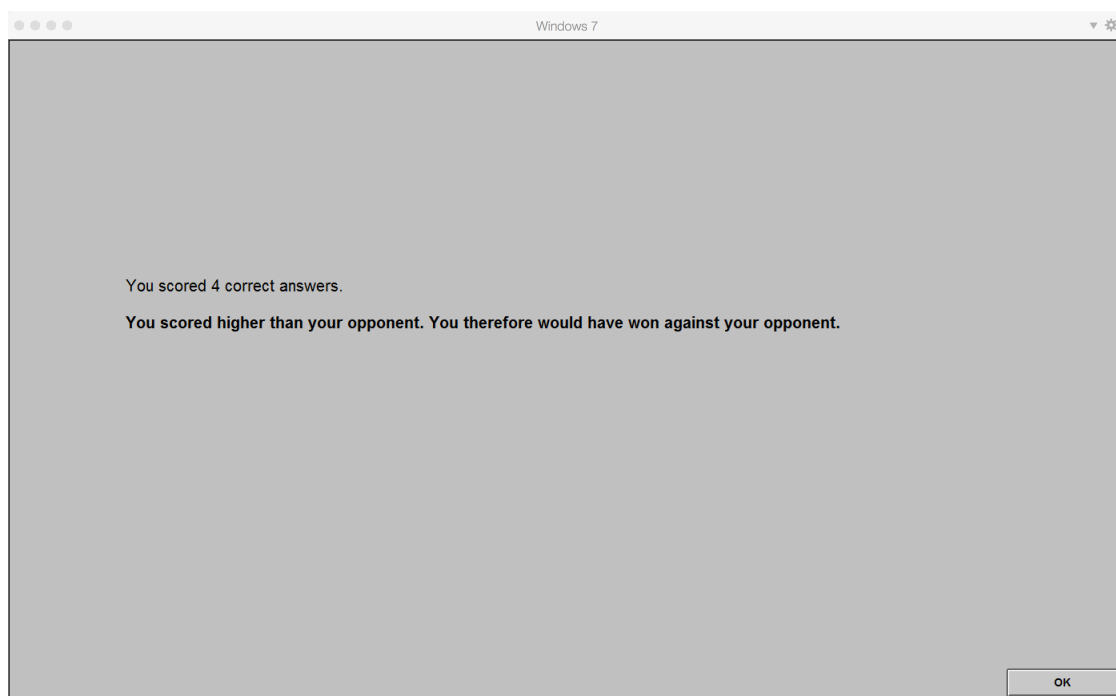
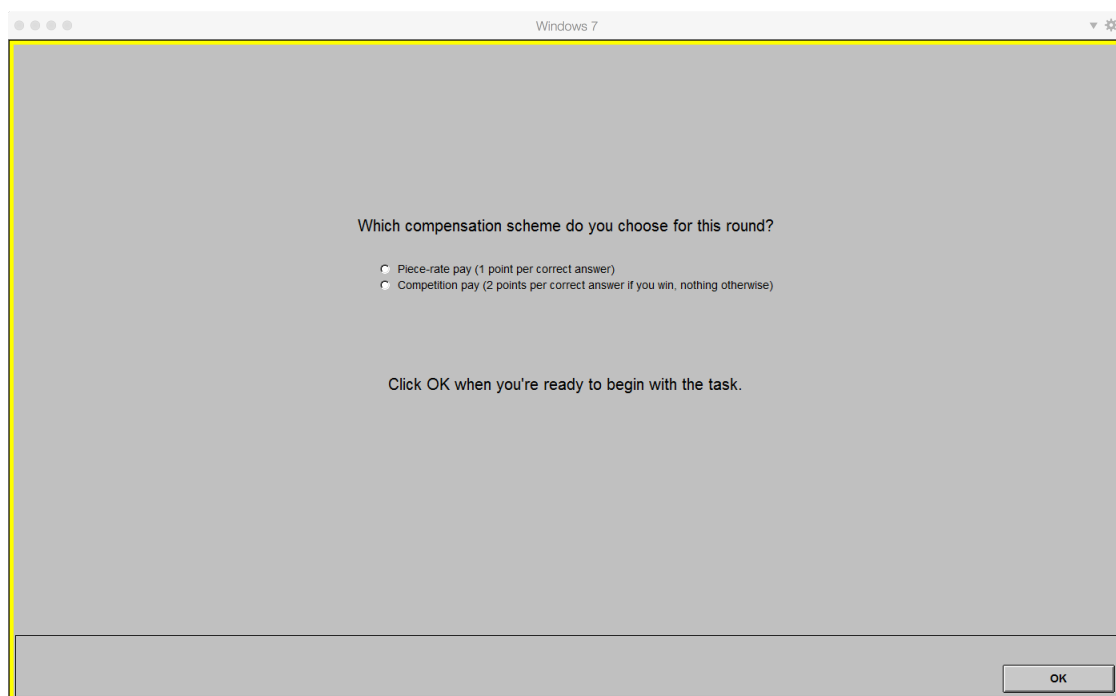
0=Not competitive at all ●●●●●●●●●● 10=Very competitive

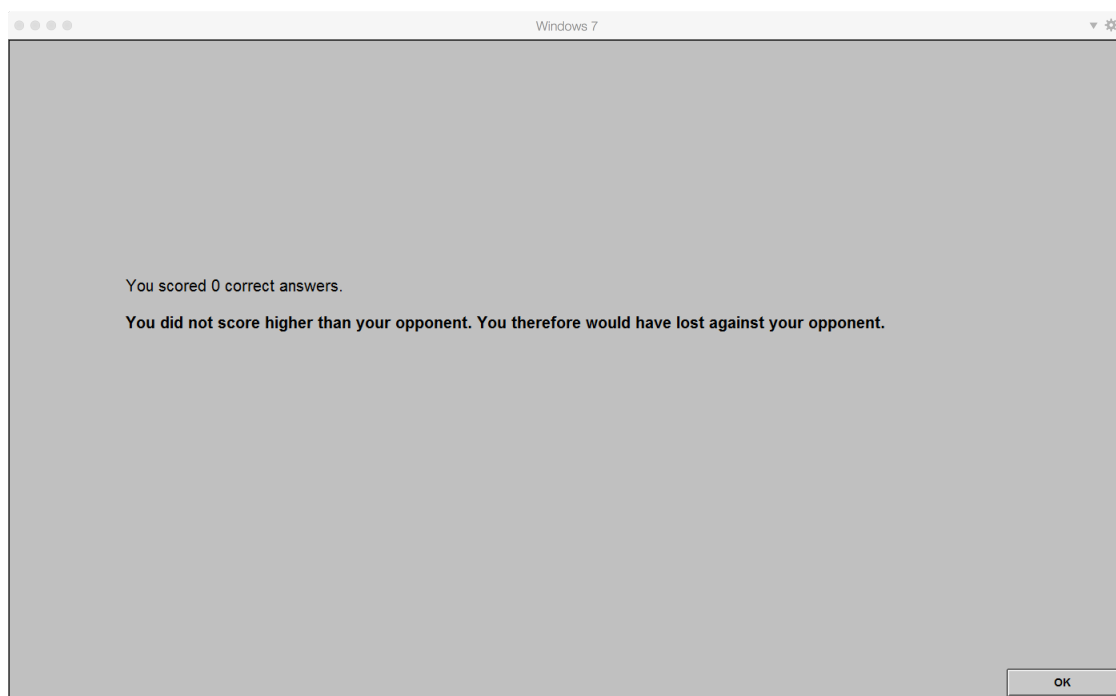
Feedback experiment











Risk experiment

