LUCK OR SKILL: HOW WOMEN AND MEN ATTRIBUTE SUCCESSES AND FAILURES

ONLINE APPENDIX (NOT FOR PUBLICATION)

G. Kartini Shastry	Olga Shurchkov	Lingjun "Lotus" Xia
Wellesley College	Wellesley College	Wellesley College

Contents

A. Screenshots of Instructions for the Main Experiment

WELLESLEY

Participation is voluntary
It is your choice whether or not to participate in this research. If you choose to participate, you may change your mind and quit the study at any time. Refusal to participate or stopping your participation will involve no penalty or loss of benefits to which you are otherwise entitled.

What is the purpose of this research?
The purpose of this research is to understand how individuals perform in certain types of analytical tasks.

How long will I take part in this research?
Your participation will take approximately 10 minutes to complete.

What can I expect if I take part in this research?
As a participant, you will answer a series of questions.

What are the risks and possible discomforts?
If you choose to participate, the effects should be comparable to those you would experience from viewing a computer monitor for 10 minutes and using a mouse or keyboard.

Are there any benefits from being in this research study?
In addition to payment, the study includes analytical questions that may be interesting to consider.

Will I be compensated for participating in this research?
You will receive a base payment of $0.5 if you finish the survey and pass the attention checking questions. You will also receive bonus based on your performance in this survey. On average, you will get $1.6 of bonus, in addition to the base payment. Note that if you fail to answer the attention checking questions correctly, you will not receive any compensation.

If I take part in this research, how will my privacy be protected? What happens to the information you collect?
Your data will be kept completely anonymous by the assignment of random participant numbers. Your data will be linked only to your participant number; there is no way of matching any data collected to your name. When the research is completed, the raw data will be stored on a password-protected computer, accessible only to the researchers.

If I have any questions, concerns or complaints about this research study, who can I talk to?
The researcher for this study is Olga Shurchkov who can be reached at 781-283-2984, 106 Central St., Wellesley, MA 02481, olga.shurchkov@wellesley.edu
This research has been reviewed by the Institutional Review Board of Wellesley College. If you have any questions about your rights as a participant in this study or any concerns or complaints, please contact the chair of the Wellesley College IRB, Nancy Marshall, nmarshal@wellesley.edu

Consent
You may wish to print this page for your records.

I would like to participate in this study

I would like to leave this study

WELLESLEY

Here is your 5-digit ID number for this HIT: 14816

Please write the ID number down. It is absolutely essential that you keep this ID with you throughout this HIT. This is the identifier we use to pay you for your participation.

You need to enter the 5-digit ID number above in **TWO** different places:
(1) On the last page of this survey.
(2) On the MTurk page for this HIT.

>>

This survey consists of two rounds. Each round contains a section of problem solving and a few open-ended questions.

You will be paid a base payment of **$0.5** for your participation in this study, which will take about 10 minutes. You will also be paid a **bonus** based on your performance in the problem solving sections. Detailed payment scheme will be revealed after you complete each section of problem solving.

Now, round 1 begins.

In the beginning of the section, you will carefully read the instructions and an example of the kind of questions you will see in this section.

Then you will have **2.5 minutes** to complete as many problems as you can. Time will run out automatically. You will not be able to advance to the next section before the end of the 2.5 minutes.

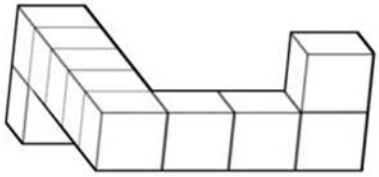
After the 2.5-minute problem solving period, we will ask you to answer a few follow-up questions.

There is an **attention checking question** in this section. If you fail to answer it correctly, you will not be able to continue with the rest of the experiment, and you will not receive any compensation for participating.

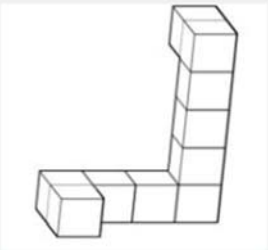
>>

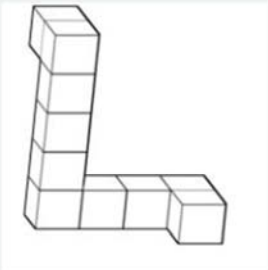
Below is an example of the type of problems you will see in this problem solving section.

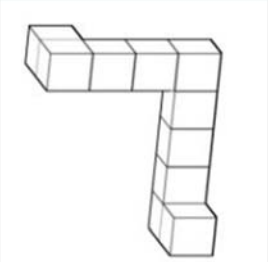
For each question, you will see a target shape at the top, and three choices. Select the choice that is a **rotated version** of the target one at the top.



PRACTICE: Select the shape below that is a rotated version of the one at the top (these shapes, made up of ten blocks, are similar to the ones that will follow).





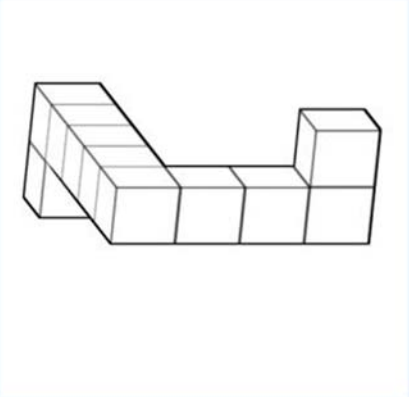


>>

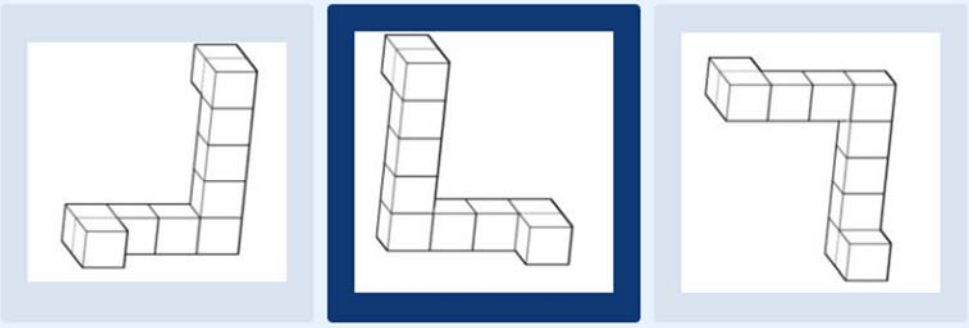
Below is an example of the type of problems you will see in this problem solving section.

For each question, you will see a target shape at the top, and three choices. Select the choice that is a **rotated version** of the target one at the top.

Please answer this question.



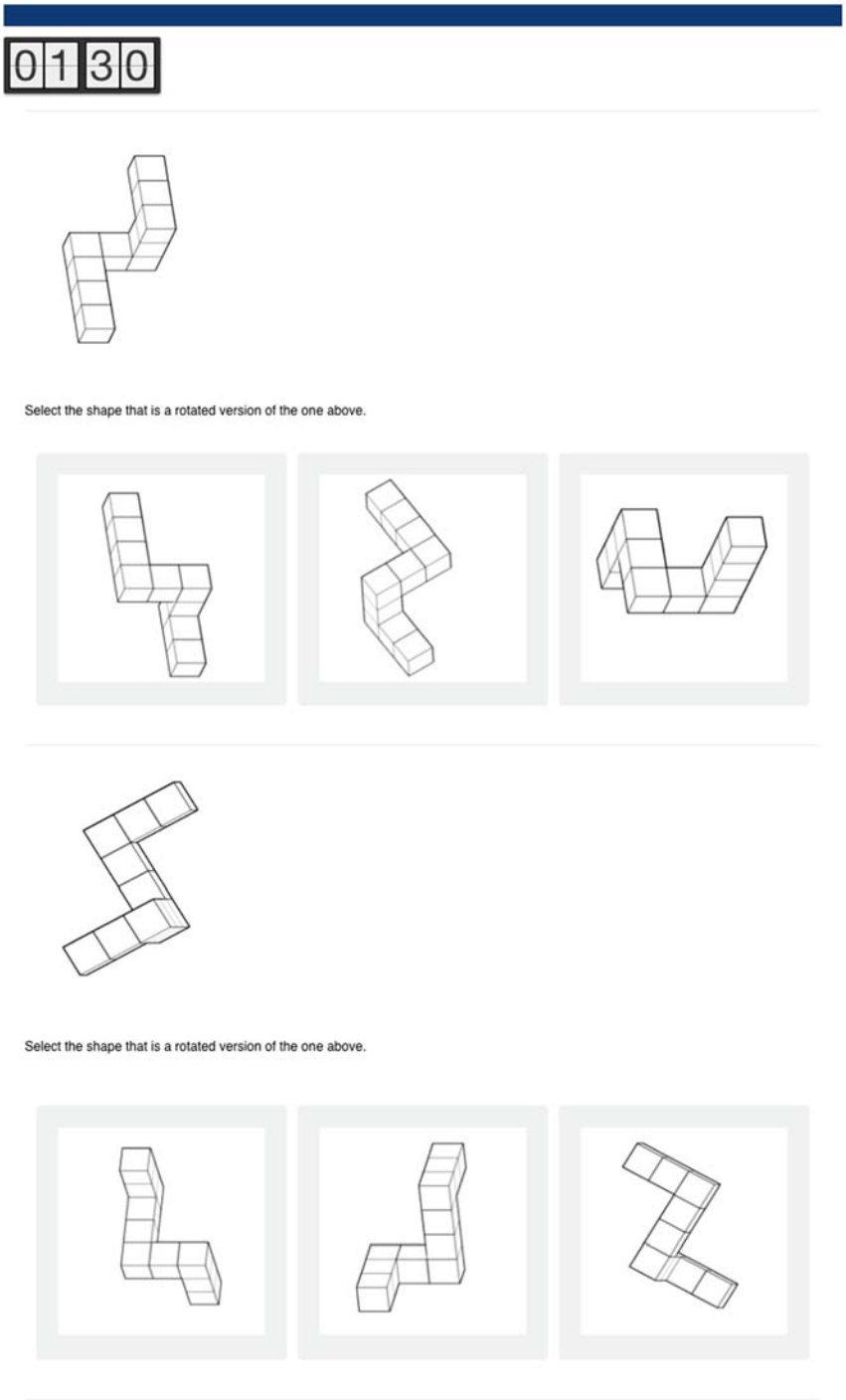
PRACTICE: Select the shape below that is a rotated version of the one at the top (these shapes, made up of ten blocks, are similar to the ones that will follow).



>>

Now, you will have **2.5 minutes** to solve as many problems as possible in this section. Time will run out automatically. You will not be able to advance to the next section before the end of the 2.5 minutes.

>>



followed by more MRT questions below…

This is a question to ensure that you are paying attention. If you do not answer it correctly, you will not receive compensation for taking the survey. Please choose the most accurate description of your current activity.

- I am jogging outside.
- I am sleeping.
- I am swimming.
- I am playing the piano.
- I am taking a survey.

>>

How many questions do you think you solved correctly in this section?

>>

As alluded to in the beginning of this section, your bonus will be calculated based on your performance in the problem solving section. Here is how we will calculate your bonus payment:

We previously ran this test on a similar group and got the performance. We will randomly pair you with a participant from that group, and your payment will be as follows:

- If your total score is **higher** than your match's, you get **20 cents** for each correct answer.
- If your total score is **lower** than your match's, you get **15 cents** for each correct answer.

For example, if your score is 3 in the problem solving section, while your randomly chosen match's score is 2, then you will get a bonus of 60 cents (20 cents * 3 correct answers). On the other hand, if your score is 1 and your match's score is 2, then you will get a bonus of 15 cents (15 cents * 1 correct answer).

>>

Our matching process has randomly matched you with a participant from the other group. Your score has been compared with his/hers, and your payment is shown below.

Please click on the number to indicate that you have seen this payment.

0

Unknown Gender Condition

OR

Our matching process has randomly matched you with a male participant from the other group. Your score has been compared with his, and your payment is shown below.

Please click on the number to indicate that you have seen this payment.

0

Male Match Condition

OR

Our matching process has randomly matched you with a female participant from the other group. Your score has been compared with hers, and your payment is shown below.

Please click on the number to indicate that you have seen this payment.

0.15

Female Match Condition

>>

Do you think your payment is an **above average** payment or a **below average** payment ?

above average

below average

>>

We have calculated the average payment of the group of participants who have previously completed the same test. Compared with the average payment, your payment is **below average**.

Forced feedback condition
(if payment below average)

>>

We have calculated the average payment of the group of participants who have previously completed the same test. Compared with the average payment, your payment is **above average**.

Forced feedback condition
(if payment above average)

>>

Now you have an opportunity to find out if your payment is above the average payment of the other group. The knowledge of your **relative payment** will inform your decision in the next round and influence your payment.

Please select the **maximum amount** you are willing to pay to receive this information.
Please note that, if you select a certain amount, we automatically assume you are willing to pay any price that is lower than your selection. For example, if you select 10 cents, we automatically assume that you are also willing to pay 5 cents.

Then, we will randomly draw a price from these five options. If this price is less than or equal to your maximum, then the price will be subtracted from your payment, and you will receive information about your relative payment. On the other hand, if this price is greater than your maximum, then you will not get any information, and your payment will be unaffected.

Please note that, in a rare instance, your price of information may be greater than your final bonus payment, in which case, the difference will be deducted from your base payment.

- 5 cents
- 10 cents
- 15 cents
- 20 cents
- 25 cents

Optional feedback condition

>>

The randomly selected amount is: 15

You have indicated that you are NOT willing to pay this much.

Optional feedback condition
(if bid is below feedback price)

>>

The randomly selected amount is: 10

You have indicated that you are willing to pay this much.

Optional feedback condition
(if bid is above feedback price)

>>

We have calculated the average payment of the group of participants who have previously completed the same test. Compared with the average payment, your payment is **above average.**

Optional feedback condition (if bid is above feedback price and payment above average)

>>

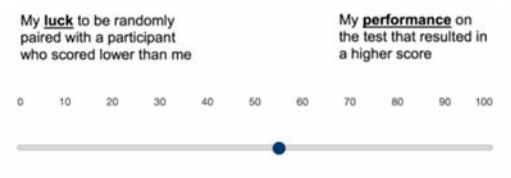
We have calculated the average payment of the group of participants who have previously completed the same test. Compared with the average payment, your payment is **below average**.

Optional feedback condition (if bid is above feedback price and payment below average)

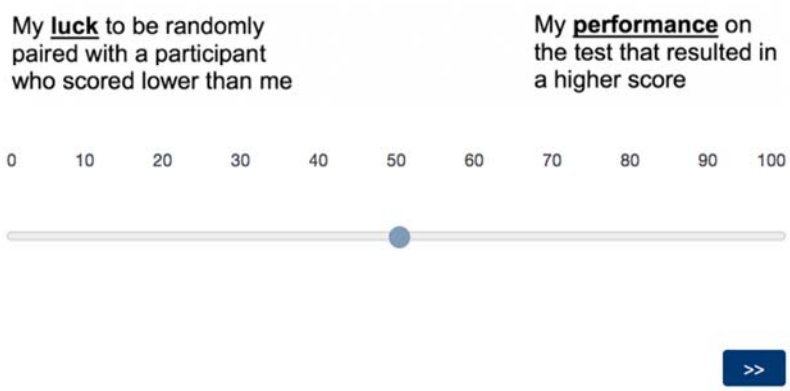
>>

On a scale from 0 to 100, please rate the relative importance of your own test score and your random match's score in contributing to your overall payment.

Example:
For example, if you choose 55 as shown in the example, you attribute 55% of your payment to your **performance** on the test that resulted in a higher score, and 45% of your payment to your **luck** of being randomly paired with a participant who scored lower than you.



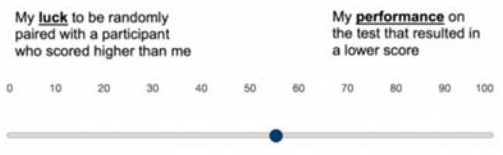
Now, move the slider to indicate the relative importance of your own test score and your random match's score in contributing to your overall payment.



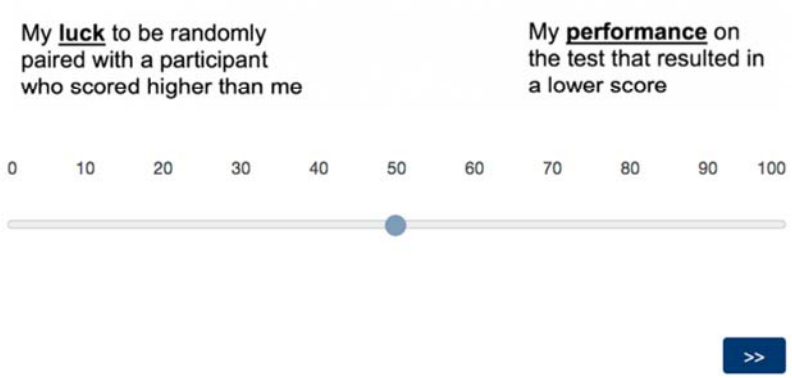
Attribution question if success

On a scale from 0 to 100, please rate the relative importance of your own test score and your random match's score in contributing to your overall payment.

Example:
For example, if you choose 55 as shown in the example, you attribute 55% of your payment to your **performance** on the test that resulted in a lower score, and 45% of your payment to your **luck** of being randomly paired with a participant who scored higher than you.



Now, move the slider to indicate the relative importance of your own test score and your random match's score in contributing to your overall payment.



Attribution question if failure

Now, Round 2 begins.

You will have 2.5 minutes to complete another section of the same kind of problems as in the first round.

Before you work on the problems, you will have an opportunity to choose what kind of payment scheme you want to use in this round.

Option 1:
We randomly pair you with a participant from the other group.

- If your total score is higher than your match's, you get **25 cents** for each correct answer.
- If your total score is lower than your match's, you get **10 cents** for each correct answer.

Option 2:
You get **17.5 cents** for each correct answer, regardless of anyone else's score.

Your bonus payment for this section will be determined depending on what option you choose.

Which payment scheme do you want to use?

Option 1

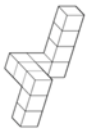
Option 2

>>

You have chosen your payment scheme for this round. The second section of problem solving starts on next page.

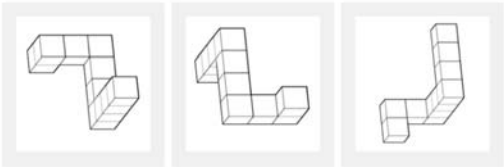
>>

0219



Select the shape that is a rotated version of the one above.

Select the shape that is a rotated version of the one above.



...and more MRT questions below

You have completed all of the questions. Since you selected option 1 as your payment scheme, our matching process has randomly paired you will a participant from the other group. For your information, the score of your random match is shown below.

Please click on the number to indicate that you have seen the number.

1

You have completed all of the questions. We will calculate your bonus payment in this round and add it to your bonus payment in round 1. The final payment will be transferred to you within seven days.

Please continue to next page to complete a short questionnaire.

>>

If Option 1 is chosen

You have completed all of the questions. We will calculate your bonus payment in this round and add it to your bonus payment in round 1. The final payment will be transferred to you within seven days.

Please continue to next page to complete a short questionnaire.

>>

If Option 2 is chosen

Please rank from 1-10 how you see yourself:

Are you generally a person who avoids taking risks or are you fully prepared to take risks?

(1 is unwilling to take risks and 10 is fully prepared to take risks)

1 2 3 4 5 6 7 8 9 10

Do you think men or women are more likely to get a high score in this task?

men

women

What is your gender?

Male

Female

Other/ Do not wish to disclose

What is your age in years?

What is the highest level of education you have completed?

- Less than high school
- High school or GED
- Some College
- 2-year college degree (Associate)
- 4-year college degree (BA, BS)
- Master's degree (MA, MS)
- Doctoral degreed (PhD)
- Professional degree (MD, JD, DDS, etc.)

Are you of Hispanic origin or descent, such as Mexican, Puerto Rican, Cuban, or other Spanish background?

- Yes
- No

Which of the following best describes your race?

- White
- Black or African American
- Native American
- Asian
- Asian-Pacific Islander
- Other/ Do not wish to disclose

Which of the following best describes your annual household income before taxes?

- Less than $10,000
- $10,000 - $19,999
- $20,000 - $29,999
- $30,000 - $39,999
- $40,000 - $49,999
- $50,000 - $74,999
- $75,000 - $99,999
- $100,000 - $149,999
- $150,000 - $249,999
- $250,000 - $499,999
- $500,000 and over

>>

B. Pilot Survey Protocol

The experiment will be conducted on the Amazon platform MTurk using a fully computerized survey. The procedures are explained briefly below.

The pilot study will be conducted in two waves. In both waves, participants will complete three sets of questions: Mental Rotation Task (MRT) questions; "find the median" questions; and "missing shape" questions (see examples below). Within each section, the order of questions will be randomly assigned. Each question section will last 5 minutes. Participants will not be able advance to the next page before the end of the 5 minutes.

After each section, participants will be asked to state how many questions they think they have solved correctly and which gender (female or male) is more likely to perform well on this task. Specifically, we will ask:

"How many questions do you think you solved correctly in this section?"

"Do you think men or women are more likely to get a high score in this section? Please select one:

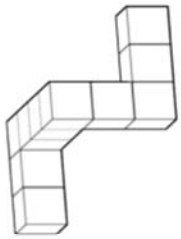
Men Women"

The only difference between the two waves is the payment scheme. In the first wave, we will pay participants for their participation: each participant will receive $5 regardless of how many questions they have solved correctly. In the second wave, we will pay participants based on their performance in the study: after each section, we will randomly pair a participant from the first wave (P1) with a participant in the second wave (P2). If P2 correctly solves more questions than P1, then we will pay P2 $1.5X or $2X per correct answer. If P2 correctly solved less questions than P1, then we will pay P2 $X per correct answer. The amount of X will depend on how well people perform in the first wave. We will ensure that the average payoffs across the two waves are comparable. Participants will learn their payment scheme in the beginning of the survey.

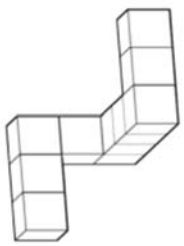
Throughout, we will include questions that check respondents' attention. At the end of the first wave and the second wave, we will ask a few demographic questions (see below).

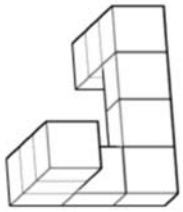
MRT

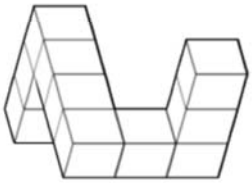
In each question, you will see a target shape at the top, and three choices. Select the choice that is a **rotated version** of the target one at the top.



Select the shape that is a rotated version of the one above.



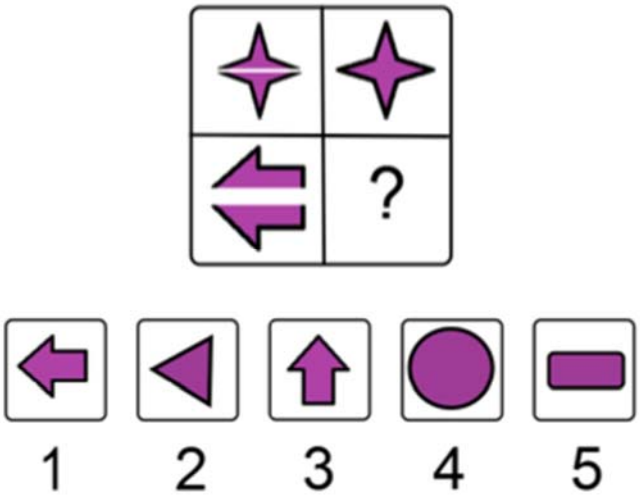




In this example, the answer is the third choice.

Missing shape puzzle

In each problem, you will see a sequence of shapes. Your job is to fill in the question mark with a shape from the choices.



In this example, the answer is the first choice

Find the median task [Note that this task was only piloted in the first wave]

In each problem, you will see a grid that contains 9 numbers. Your job is to identify the **median** of the 9 numbers.

What is the median? Imagine you lined up the 9 numbers in order, from smallest to largest. The median would be the number in the middle -- the number that is greater than exactly 4 of the numbers and less than exactly 4 of the numbers.

2.34	0.16	3.52
4.58	7.14	2.86
1.64	8.27	6.82

In this example, 3.52 is the median.

Demographic questions:

1. **What is your gender?**

   a. Male
   b. Female
   c. Other/Do not wish to disclose

2. What is your age in years?

3. What is the highest level of education you have completed?

   a. Less than high school
   b. High school or GED
   c. Some college
   d. 2-year college degree (Associates)
   e. 4-year college degree (BA, BS)
   f. Master's degree (MA, MS)
   g. Doctoral degree (PhD)
   h. Professional degree (MD, JD, DDS, etc.)

4. Are you of Hispanic origin or descent, such as Mexican, Puerto Rican, Cuban, or other Spanish background?

a. Yes
b. No

5. Which of the following best describes your race?

a. White
b. African-American or Black
c. Asian
d. Native Hawaiian or Other Pacific Islander
e. Native American
f. Other/Do not wish to disclose

6. Which of the following best describes your annual household income before taxes?

a. Less than $10,000
b. $10,000 - $19,999
c. $20,000 - $29,999
d. $30,000 - $39,999
e. $40,000 - $49,999
f. $50,000 - $74,999
g. $75,000 - $99,999
h. $100,000 - $149,999
i. $150,000 - $249,999
j. $250,000-$499,999
k. $500,000 and over

C. Results of Pilot Surveys

We conducted a pilot survey (pilot wave 1) using 50 AMT subjects, different from those in the main experiment, in order to determine the most suitable task from the list of three potential candidates: Mental Rotation Task (MRT); "find the median" task; and a "pattern" task (also known as MPT or the matrix test). Pilot subjects first completed five-minute rounds of each task presented to them in random order, and after each round were asked to predict their score and to answer a gender perception question, which read: "Do you think men or women are more likely to get a high score in this section?" Based on this pilot wave, only the MRT produced significant gender differences in gender perception and confidence (see Table C1 below). None of the three tasks yielded a statistically significant difference in actual performance in wave 1. However, in a second pilot survey (pilot wave 2) using a different set of AMT subjects, the pattern test resulted in a significant gender gap in performance, while the MRT did not (see Table C2 below).

Table C1: Averages for Wave 1

	Average Score	Average Confidence	Share Reporting Gender X is Better
MRT Test			
Male	8.59	9.83	0.65
Female	7.15	7.80	0.35
t-test p-value	(0.1276)	(0.0463)	(0.0306)
Pattern Test			
Male	19.66	13.72	0.41
Female	18.40	13.20	0.59
t-test p-value	(0.3357)	(0.3948)	(0.2017)
Find the Median Test			
Male	17.24	13.52	0.51
Female	19.40	11.45	0.49
t-test p-value	(0.2580)	(0.3398)	(0.8881)
Number of observations	50	50	50

Table C2: Averages for Wave 2

	Average Score	Average Confidence	Share Reporting Gender X is Better
MRT Test			
Male	7.24	7.52	0.57
Female	6.60	5.08	0.43
t-test p-value	(0.3983)	(0.0034)	(0.3319)
Number of observations	51	51	51
Pattern Test			
Male	20.57	16.10	0.44
Female	17.11	11.50	0.56
t-test p-value	(0.0657)	(0.0231)	(0.4016)
Number of observations	50	50	50

D. Analysis of Gender Differences, Comparing the No Feedback Condition to the Forced Feedback Condition

To verify our findings with the effect of feedback, we consider those who did not get feedback and compare their attribution to those who did get feedback:

$$Attribution = \beta_0 + \beta_1\, female + \beta_2\, maleXforced + \beta_3\, femaleXforced + \epsilon$$

where $forced$ is a dummy variable that equals 1 when the participant is in the forced feedback condition, and equals 0 if the participant is in the no feedback condition.

We note the following caveat: the measure of attribution differs slightly for people in the no feedback condition and in the forced feedback condition. Consider the following example. If a participant self-evaluated to have an above-average payment, then if she were assigned to no feedback condition, then she would be attributing her success to her ability or luck, whereas if she were assigned to forced feedback condition and received a negative feedback, then she would be attributing her failure to either her ability or her luck. In short, whether or not a participant receives feedback determines whether she is attributing her perceived payment or her actual payment, which potentially complicates our interpretation with the interaction of $femaleXforced$ in the above regression. Nonetheless, we expect to see similar pattern with this specification.

We separate the analyses into four cases, depending on participants' payment-confidence and feedback positivity: positive reinforcement, negative reinforcement, positive surprise, and negative surprise. We define the four cases below. Table D1 presents the results.

	Payment-confident	**Not payment-confident**
(Potential) positive feedback[1]	Positive reinforcement	Positive surprise
(Potential) negative feedback	Negative surprise	Negative reinforcement

[1] Since some participants in this analysis did not receive feedback at all, we say a participant receives potential positive feedback if she either receives positive feedback or would received positive feedback if she were to receive one. Similarly for potential negative feedback.

After getting a reinforcing negative feedback (Columns 1 and 2), both men ($p < 0.1$) and women ($p < 0.1$) attribute it to ability. There is no significant gender difference in the attribution pattern.

After receiving a surprising negative feedback (Columns 3 and 4), men attribute the negative surprise to luck, although the change is not significant. Women, on the other hand, attribute the negative outcome to their lack of ability ($p < 0.01$). The F-test at the bottom of the table shows that the change in attribution after receiving a negative surprise is significantly different for men and women ($p < 0.01$).

After getting a reinforcing positive feedback, women ascribe it to luck, whereas men do not update their attribution compared to those who did not receive feedback. The gender difference in attribution is significant ($p < 0.1$).

After getting a surprising positive feedback, both men and women ascribe it more to luck, although the change in not significant for either gender.

To summarize, we find the following differential pattern of attribution of feedback to luck versus ability between men and women:

1. Women attribute negative feedback to lack of ability, regardless of whether it is consistent with their self-evaluation.
2. Men attribute negative feedback to bad lack when the feedback underlines their positive self-evaluation. They attribute negative feedback to lack of ability only when they hold a negative self-evaluation initially.
3. Upon receiving a surprising positive feedback, women attribute it more to luck relative to men.

Table D1. Gender Difference in Attribution of Feedback (including participants who did not receive feedback)

Samples	negative reinforcement		negative surprise		positive reinforcement		positive surprise	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
female	-0.25	-2.37	-7.57	-7.94	14.00*	18.86**	12.33	5.46
	(7.23)	(7.33)	(9.31)	(9.93)	(8.05)	(9.15)	(17.73)	(15.98)
maleXforced	14.53**	14.53*	-9.00	-9.56	-8.3	-1.99	-15.05	-13.61
	(7.26)	(7.47)	(8.14)	(7.70)	(8.54)	(8.59)	(14.96)	(22.20)
femaleXforced	11.46**	10.71*	21.33***	21.59***	-35.94***	-33.58***	-14.55	-1.48
	(5.57)	(5.66)	(7.38)	(7.47)	(5.38)	-5.35	(14.56)	(16.28)
score in Section 1		0.34		-0.02		3.44		-2.52
		(1.62)		(1.89)		-2.56		(7.01)
estimation of score in Section 1		-0.94		2.3		0.73		7.21**
		(1.54)		(2.59)		-2.3		(3.08)
risk		-1.31		-0.16		0.48		-1.79
		(0.89)		(1.45)		-1.08		(2.69)
Dependent variable mean	66.13	66.13	62.44	62.44	73.65	73.65	56.80	56.80
F-test of interactions (p-value)	0.7382	0.6855	0.0073	0.0045	0.0088	0.0011	0.9811	0.5689
Observations	136	135	79	79	49	49	30	30
R-squared	0.06	0.08	0.13	0.15	0.18	0.27	0.1	0.28

Notes: Robust standard errors in parentheses. Only Wave 1 and Wave 2 of our experiment included the attribution question. Therefore, this regression analysis is based on these two waves. The entire analysis shown in this table is restricted to participants who were assigned to the no feedback condition or the forced feedback condition. In negative reinforcement, we further restrict to participants who were not payment-confident and who would receive negative feedback confirming their belief. In negative surprise, we further restrict to participants who were payment-confident and who would receive negative feedback. In positive reinforcement, we further restrict to participants who were payment-confident and would receive positive feedback. In positive surprise, we further restrict to participants who were not payment-confident and who would receive positive feedback. F-test of interactions tests against the null hypothesis that maleXforced is equal to femaleXforced. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

E. Robustness Checks

Table E1. Determinants of Tournament Entry Decision by Treatment (Logistic Estimates)

Samples	No Feedback		Forced Feedback	
	(1)	(2)	(3)	(4)
Female	-1.27*	-1.18	0.51	0.92
	(0.73)	(0.73)	(0.68)	(0.71)
Male x Score in Section 1	0.05	-0.03	0.31***	0.38***
	(0.11)	(0.11)	(0.10)	(0.11)
Female x Score in Section 1	0.31**	0.27**	0.23**	0.28**
	(0.12)	(0.13)	(0.10)	(0.11)
Risk		0.10		0.30***
		(0.07)		(0.06)
Score Confidence		0.14		-0.09
		(0.09)		(0.07)
Dependent variable mean	0.39	0.39	0.35	0.35
F-test of interactions (p-value)	0.107	0.071	0.594	0.490
Observations	204	204	288	287

Notes: Robust standard errors in parentheses. All specifications are based on data from no feedback and forced feedback conditions. F-test of interactions tests against the null hypothesis that Male x Score in Section 1 is equal to Female X Score in Section 1. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.