The effect of preparation on gender differences in willingness to compete

Authors

Keana Richards, Dr. Gideon Nave, and Dr. Coren Apicella

Motivation

Although women have surpassed men in education outcomes, like college attendance and graduation rates,[1] they are still underrepresented in top positions in nearly all sectors[2] and a gender wage gap still persists.[3] Traditional economic variables account for some, but not all, of these disparities.[3] As such, additional explanations have been proposed, including gender differences in willingness to compete.[4,5] Previous research suggests that women are less willing to compete than men, even when they are equally, if not more, qualified.[6] A few factors, including women's relatively lower levels of confidence in their performance, have explained this gender difference.[7] The proposed study explores the effect of preparation on women's willingness to compete. Since prior research has shown that confidence can improve with preparation and training,[8-10] providing women with adequate opportunity to practice/study before a task may help alleviate the gender gap in willingness to compete. Given observed gender differences in confidence,[11] we also hypothesize that women will spend more time preparing for tasks than men. Finally, we will examine lay beliefs about potential gender differences in how much men and women prepare before tasks.

Overview

In this current study, we examine how knowing that there will be an opportunity to prepare before a task affects men and women's willingness to compete in a multiplication task. 1000 participants from Amazon Mechanical Turk will be randomly assigned to one of two conditions: a control condition and a preparation condition. In the preparation condition, participants will be told that they will have an unlimited opportunity to practice (i.e., study multiplication tables) before they complete a multiplication task, where participants in the control condition will not receive this information beforehand. Crucially, participants in both conditions will only be given the opportunity to practice/study after they make their decision on whether to be paid based on their relative (compete) or individual (not compete) performance. Thus, participants in both treatment groups will be given the opportunity to practice, but only the participants in the preparation condition will have knowledge of this opportunity before deciding on a payment scheme.

Sampling Plan

Data collection for this project has not yet begun. We plan to recruit 1000 participants on Amazon Mechanical Turk to complete a study examining "decision-making and performance." The participants will be guaranteed $.20 for completing the survey, along with any bonuses they earn during the competition rounds. Men and women will be evenly assigned to both conditions.

Variables

Manipulated variables

Knowledge of preparation condition: Participants will be randomly assigned to either a condition where they know they will be able to prepare before completing the task or a control condition, where they will not be provided this information. We are interested in how knowledge of the ability to prepare for a task affects choice of a payment scheme. Notably, participants in both conditions will have the opportunity to prepare after they decide on the payment scheme.

Measured variables

Gender: Participants' gender will be coded as 1 if they indicate they are female, and 0 if they indicate they are male. Gender will be collected with basic demographic information at the beginning of the survey.

Willingness to compete: Participants' payment scheme choice will be coded as 0 if they choose the piece-rate payment scheme, and 1 if they choose the tournament payment scheme.

Confidence: After completing the tasks, participants will be incentivized to guess their relative performance compared to all other participants that completed the task by indicating the decile of their score relative to other participants. If they answer correctly and confidence is randomly selected as the incentivized post-competition measure for a bonus, they will be awarded $.10.

Risk aversion (self-reported): We will use the typical operationalization of risk aversion used in previous studies, where participants will respond to the question "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?" on a 0-10 scale.

Willingness to prepare: When offered to prepare, we will indicate whether participants agreed to do so (1) or decided to move onto the task without preparation (0).

Total time spent preparing (in seconds): The total duration of time spent practicing problems and studying multiplication times tables will be recorded and log transformed before analyses.

Number of problems completed during time spent preparing (in seconds): The number of problems completed relative to the amount of time spent in the practice round will be recorded by dividing the number of questions answered correctly by the time spent.

Perceptions of gender differences: After completing the task, participants will be asked questions about their expectations of gender differences in performance ("Do you think men or women in this study correctly solved more multiplication problems on average?"), willingness to prepare ("Do you think men or women in this study spent more time practicing/studying before completing the multiplication task?"), and willingness to compete ("Do you think men or women in this study chose the tournament payment option more often?"). If a participant chooses "men," their response will be coded as 0. Also, if they answer correctly and one of their responses is randomly selected as the incentivized post-competition measure for a bonus, they will be awarded $.10. An additional question about perceptions of general gender differences in willingness to prepare that will not be incentivized will be included after they respond to the first four questions: "For most tasks, do you think men or women generally prepare (i.e., practice and/or study) more?" This question will not be incentivized because we cannot attest to its accuracy.

Number of comprehension check questions incorrect: Participants will be asked a series of comprehension check questions to assess their understanding of the payment schemes, which must be answered correctly for them to be able to participate. We will count the number of problems that they answer incorrectly until they proceed.

Reported calculator use: Participants will answer a series of questions regarding their use of calculators to complete the task and perceptions of how much faster they could complete the problems with a calculator. We will ask participants to (1) indicate if they used a calculator, (2) perceptions of calculator use across all participants, and (3) whether they thought calculator use was beneficial for their own and others' performance.

Study Timeline:

1. Participants complete a series of exclusion questions - where they are excluded if they don't meet the exclusion criteria designated below
2. After providing their MTurk ID and consent, participants will learn about the general structure of the multiplication task, where they multiply two numbers (with digits ranging from 1-12) for 2 minutes. Then, they complete a series of comprehension check questions to ensure they understand the task. They must pass all comprehension check questions to proceed. Otherwise, they will repeat the comprehension check questions until they answer them correctly.
3. Participants are randomly assigned to either the control condition or knowledge of preparation condition
4. For participants randomly assigned to the knowledge of preparation condition, they will be told about their ability to prepare after receiving the general instructions for the task (see Appendix)
5. Both groups then proceed to learn more information about the two payment schemes and complete comprehension check questions to ensure they understand the payment schemes, which they must pass to proceed onto the next section
6. In the preparation condition, participants will be reminded that they have the option to prepare before completing the task, while participants in the control condition will not have this reminder. Then, participants make a payment scheme choice, where the order of the presentation of the tournament and piece-rate payment options will be randomized for each condition.
7. Afterward, participants in both conditions will choose if they want to practice/study before the task. If they agree to do so, they will be able to review any multiplication tables for numbers between 1-12 and have the opportunity to complete practice multiplication problems. They will have the option to keep practicing problems for as long as they want.
8. Participants will complete the task and receive feedback about their absolute (but not relative) performance.
9. Participants will answer the risk aversion, confidence, perceptions of gender differences, and reported calculator use questions.
10. Participant payment: After all of the data has been collected, participants will receive their guaranteed payment ($.20) and their bonus payment will be calculated based on their performance and choice of a payment scheme. If they chose the piece-rate payment scheme, they will be paid $.10 per problem solved correctly. If they chose the tournament payment scheme, they will be randomly matched with another participant that also chose this payment scheme and

if they solved more problems than the other participant, will receive $.20 per problem. Otherwise, they will receive nothing. In the case of an uneven number of participants, we will randomly assign one participant to be matched against another participant that has already been selected for a pair. If there are any ties, one of the participants will be randomly selected to receive payment for their performance. Additionally, for each participant, we will randomly select one of their four guesses about their own performance and gender differences, and if they guess correctly for their designated question, will be paid an additional $.10.

How does knowing that you can prepare affect willingness to compete?

Hypotheses and analyses

Primary Hypothesis I

There will be an interaction between gender and condition, where we will observe the typical gender gap in willingness to compete in the control condition. However, women in the preparation condition will be more likely to compete than women in the control condition, and the effect will be greater than the equivalent effect in men. Therefore, we expect all coefficients for all of the predictors to be significant.

Model: Logistic regression

Predictors: Gender, condition, and gender*condition

Outcome*:* Willingness to compete

Primary Hypothesis II

Women will be more likely to take advantage of the opportunity to prepare (collapsed across both conditions), so the coefficient for gender will be significant.

Model: Logistic regression

Predictors: Gender

Controls: Willingness to compete

Outcome: Willingness to prepare

Primary Hypothesis III

Women will spend more time preparing for the multiplication task relative to men (collapsed across both conditions), so the coefficient for gender will be significant.

Model: Linear regression

Predictors: Gender

Outcome: Total time spent preparing before the multiplication task (Log transformed)

Primary Hypothesis IV

Participants will expect women to spend more time preparing for the multiplication task relative to men (collapsed across both conditions), so the coefficient for gender will be significant.

Model: Chi-squared goodness of fit test

Variables: Gender

Inference Criteria

To control for the family-wise error rate during hypothesis testing, we will run permutation tests for all analyses. We will be using two-tailed tests during all hypothesis testing ($p < .05$).

Screening and data exclusion

The workers who opted into the study had to pass several screening questions to be included as participants in the paid portion of the study. Specifically, participants included in the study had to (i) be using a computer (rather than a phone or tablet), (ii) identify their nationality as American and live in the United States (to control for gender differences in competitiveness across cultures), and (iii) indicate that they were male or female (instead of responding "Other" when asked about their gender). Also, we excluded the second response for participants who had an identical IP address, MTurkID, and gender. Additionally, for participants who did not enter valid MTurkIDs but had the same IP address, we deleted the second response. If participants had the same IP address but a different MTurkID, both responses were included in the data.

Exploratory Analyses

Exploratory analysis I
Model: Logistic regression (data pooled across conditions)
Predictors: Gender, risk, and confidence
Outcome: Willingness to compete

Exploratory analysis II
Model: Logistic regression
Predictors: Gender, condition, gender*condition, risk, confidence
Outcome*:* Willingness to compete

Exploratory analysis III
Model: Linear regression
Predictors: Gender
Outcome*:* Number of questions practiced relative to the time spent preparing

Exploratory analysis III
Model: Ordinal logistic regression (collapsed across conditions)
Predictors: Time spent preparing
Outcome*:* Confidence

Exploratory analysis IV
Model: Logistic regression (collapsed across conditions)
Predictors: Time spent preparing
Outcome*:* Willingness to compete

Control: Gender

Exploratory analysis V
Model: Chi-square test of independence (collapsed across conditions)
Variables: Reported calculator use (averaged across questions) and gender
* Note: if null hypothesis is rejected, reported calculator use will be included as a control in the primary hypothesis testing to see if any observed effects are robust to its inclusion.

Exploratory analysis VI
Model: Chi-square test of independence (collapsed across conditions)
Variables: Reported calculator use (averaged across questions) and decision to prepare
* Note: if null hypothesis is rejected, reported calculator use will be included as a control in the primary hypothesis testing to see if any observed effects are robust to its inclusion.

Exploratory analysis VII
Model 1: Chi-square goodness of fit test (collapsed across conditions) with perceptions of gender differences in performance as variable
Model 2: Chi-square goodness of fit test (collapsed across conditions) with perceptions of gender differences in willingness to compete as variable
Model 3: Chi-square goodness of fit test (collapsed across conditions) with perceptions of gender differences in general willingness to prepare as variable

Appendix

Instructions for knowledge of preparation condition (presented before payment scheme decision):

Opportunity to practice/study

There will be an option to practice/study before completing the multiplication task, available to all participants. If you take this opportunity to practice/study, we will provide you with materials that may help boost your performance in the multiplication task. You will have unlimited time to spend practicing/studying before completing the task.

References

1. Goldin, C., Katz, L. F., & Kuziemko, I. (2006). The Homecoming of American College Women: The Reversal of the College Gender Gap. *Journal of Economic Perspectives*, *20*(4), 133–156. https://doi.org/10.1257/jep.20.4.133
2. Bertrand, M., & Hallock, K. F. (2001). The Gender Gap in Top Corporate Jobs. *Industrial and*

Labor Relations Review, *55*, 3–21.
3. Blau, F. D., & Kahn, L. M. (2017). The Gender Wage Gap: Extent, Trends, and Explanations. *Journal of Economic Literature*, *55*(3), 789–865. https://doi.org/10.1257/jel.20160995
4. Apicella, C. L., & Dreber, A. (2015). Sex Differences in Competitiveness: Hunter-Gatherer Women and Girls Compete Less in Gender-Neutral and Male-Centric Tasks. *Adaptive Human Behavior and Physiology, 1*(3), 247–269. https://doi.org/10.1007/s40750-014-0015-z
5. Croson, R., & Gneezy, U. (2009). Gender Differences in Preferences. *Journal of Economic Literature, 47*(2), 448–474. https://doi.org/10.1257/jel.47.2.448
6. Niederle, M., & Vesterlund, L. (2007). Do Women Shy Away From Competition? Do Men Compete Too Much? *The Quarterly Journal of Economics*, 1067–1101. Retrieved from https://web.stanford.edu/~niederle/Niederle.Vesterlund.QJE.2007.pdf
7. Niederle, M., & Vesterlund, L. (2011). Gender and Competition. *Annual Review of Economics, 3*, 601–630. https://doi.org/10.1016/j.labeco.2009.08.002
8. Schunk, D. H. (1981). Modeling and Attributional Effects on Children's Achievement: A Self-Efficacy Analysis. *Journal of Educational Psychology, 73*(1), 93–105.
9. Schunk, D. H. (1982). Progress Self-Monitoring: Effects on Children's Self-Efficacy and Achievement. *The Journal of Experimental Education, 51*(2), 89–93.
10. Gist, M. E., & Mitchell, T. R. (1992). Self-Efficacy: A Theoretical Analysis of Its Determinants and Malleability. *The Academy of Management Review, 17*(2), 183–211.
11. Lundeberg, M. A., Fox, P. W., & Puncochaf, J. (1994). Highly Confident but Wrong: Gender Differences and Similarities in Confidence Judgments. *Journal of Educational Psychology, 86*(1), 114–121.