**The effect of unlimited 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 such as college attendance and graduation rates1, they are still underrepresented in top management positions in nearly all sectors2 and a gender wage gap still persists3. Traditional economic variables account for some, but not all, of these disparities3. As such, additional explanations have been proposed, including gender differences in willingness to compete4,5. Previous research suggests that women are less willing to compete than men, even when they are equally, if not more, qualified6. A few factors, including women’s relatively lower levels of confidence in their performance, were shown to partly explain this gender difference7. Since prior research has shown that confidence can improve with preparation and training8-10, providing potential competitors with opportunity to prepare before entering a competition may alleviate the gender gap in willingness to compete. The proposed study extends previous work where we replicated the gender difference in willingness to compete but did not find evidence that manipulating the limited opportunity to prepare (i.e., with a restricted number of problems) affected the willingness to compete. In the current study, we plan to assess whether unlimited preparation reduces the gender difference in competitiveness. Even though women were less willing to compete in previous studies, they were more likely to prepare for the task compared to men. This finding also aligned with participants’ perceptions of gender differences in preparation – that is, both men and women believed that women would prepare more for the task. Thus, we will assess whether the previously observed gender difference in preparation and lay beliefs about gender differences in preparation are replicable.

**Overview**

In the current experiment, we will examine how unlimited preparation before a task affects men and women’s willingness to compete. We plan to recruit 1,100 participants on Amazon Mechanical Turk to complete a study examining “decision-making and performance.” 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, participants will be randomly assigned to one of two conditions: a control condition that does not include an opportunity to prepare and an unlimited preparation condition. Men and women will be evenly assigned to both conditions. Participants in the unlimited preparation condition will complete as many practice multiplication problems as they want, with the option to opt out of the practice at any time through an “Opt-out” button presented in the corner of the practice screen while participants in the control condition will complete a filler task (a Captcha-style counting task) for as long as they want.

Crucially, participants will be given the opportunity to practice/study *before* they make their decision to compete. Here, we define the decision to compete as the preference for a tournament payment scheme over a piece-rate 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.

After deciding on a payment scheme, participants will complete the paid multiplication task and receive feedback about their absolute (but not relative) performance.

**Variables**

Manipulated variables

*Preparation condition:* Participants will be randomly assigned to either a preparation condition, where they will be able to prepare before completing the task for as long as they want, or a control condition, where they will not have this opportunity to prepare, completing a filler task instead. We are interested in how an unlimited opportunity to prepare for a task affects choice of a 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 tolerance (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 scale11.

*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?”). 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 overall 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 comprehension check questions that they answer incorrectly until they proceed.

*Performance on the task:* Participants’ performance on the task will be based on the number of problems they answer correctly during the 2 minutes they are allotted.

*Performance on the unlimited preparation rounds:* We will record the number of problems participants’ in the unlimited preparation condition answer correctly relative to the time they spend answering questions.

*Time spent on unlimited practice task:* For the participants assigned to the unlimited preparation condition, we will record the total amount of time they spend practicing the multiplication problems.

**Study Timeline:**

1. Participants complete a series of exclusion questions. 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 will complete a series of comprehension check questions. They must answer all comprehension questions correctly to proceed; otherwise, they will repeat them until they answer them correctly.
3. Participants are randomly assigned to either the control condition or the unlimited preparation condition.
4. Participants in the preparation condition will complete as many practice multiplication problems as they want, with the option to opt out of the practice at any time through an “Opt-out” button presented in the corner of the practice screen while participants in the control condition will complete a filler task (a Captcha-style counting task) for as long as they want.
5. Participants receive a 30-second break before proceeding onto the multiplication task
6. All participants proceed to learn more information about the two payment schemes and complete comprehension check questions to ensure they understand them, which they must pass to proceed onto the next section
7. Participants choose a payment scheme, where the order of the presentation of the tournament and piece-rate payment options will be randomized.
8. Participants will complete the paid multiplication task and receive feedback about their absolute (but not relative) performance
9. Participants will answer the questions about risk tolerance, confidence, and perceptions of gender differences.
10. Payment: Participants will receive their guaranteed payment ($1.50) immediately after completing the study and their bonus payment will be calculated based on their performance and choice of a payment scheme, which will be sent to them within 3-5 business days. Participants will be randomly assigned to a participant within the same condition, since preparation will likely improve performance. 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 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 unlimited preparation affect willingness to compete?**

**Hypotheses and analyses**

Primary Hypothesis I

Women in the unlimited preparation condition will be significantly more likely to compete compared to women in the control condition (within the subsample of participants that identify “Female” as their gender)

Model: Two-proportions z-test

Predictor(s): Condition

Outcome: Willingness to compete

**Inference Criteria**

To control the false-discovery rate during hypothesis testing, we will use the Benjamini-Hochberg correction for the exploratory 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**

1. Model: Logistic regression
   1. Predictor(s): Gender, condition, gender\*condition, risk tolerance, confidence
   2. Outcome: Willingness to compete
2. Model 1: Chi-square goodness of fit test (collapsed across conditions) with perceptions of gender differences in performance as variable
3. Model 2: Chi-square goodness of fit test (collapsed across conditions) with perceptions of gender differences in willingness to compete as variable
4. Model 3: Chi-square goodness of fit test (collapsed across conditions) with perceptions of gender differences in general willingness to prepare as variable
5. Model: Linear regression
   1. Predictor(s): Gender
   2. Outcome: Performance on the task
   3. Note: if the null hypothesis is rejected, performance will be included as a control variable in any models with gender included as a predictor
6. Model: Mediation with logistic regression
   1. Predictor(s): Condition
   2. Mediator: Confidence
   3. Outcome: Willingness to compete
7. Model: Linear regression
   1. Predictor(s): Condition
   2. Outcome: Performance on the task
8. Model: Linear regression
   1. Predictor(s): Condition\*gender
   2. Outcome: Time spent on filler/practice task
9. Model: Poisson regression
   1. Predictor(s): Condition\*gender
   2. Outcome: Number of optional filler/practice problems chosen

**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. Dohmen, T., Falk, A., Huffman, D., Sunde, U., Schupp, J., & Wagner, G. G. (2011). Individual risk attitudes: Measurement, determinants, and behavioral consequences. *Journal of the European Economic Association, 9*(3), 522-550.
12. Leslie, S.J., Cimpian A., Meyer M., & Freeland E. (2015). Expectations of brilliance underlie gender distributions across academic disciplines. *Science, 347*(6219), 262–265.
13. Milyavskaya, M., Galla, B., Inzlicht, M., & Duckworth, A. (2018, October 26). *More effort, less fatigue: How interest increases effort and reduces mental fatigue*. Retrieved from http://dx.doi.org/10.31234/osf.io/8npfx