Possible Gender Differences in the Overconfidence Study

Casey Lee

Introduction

Some individuals overestimate their abilities, influencing their decision-making, academic performance, and self-assessment. Overconfidence, when impacted by selective attention to easier tasks, can affect learning in the long-term. Prior research suggests that overconfidence may be impacted by various factors, including beliefs about intelligence. Ehrlinger, Mitchum, and Dweck (2016) explored whether intelligence is perceived as a fixed trait (entity theory) or developed (incremental theory) and how these beliefs contribute to one's overconfidence. Their findings indicate that individuals who hold an entity theory tend to exhibit greater overplacement from selective attention for easier tasks. This study further seeks to answer the question: "Does gender affect the relationship between intelligence theories and overconfidence?" To explore this, I analyzed the data from Study 3 of Ehrlinger et al. (2016), examining undergraduate college students' beliefs about intelligence, attention allocation, and self-assessment accuracy. This study has one data that includes gender as a variable and one that does not. To investigate this further, I created two regression models: one including gender as an independent variable and the other excluding gender to see if the relationship of overplacement to intelligence theory and experimental condition differed for men and women. In addition to the two regression models, I used the whole sample using cross-validation in my analysis to provide an estimate of both models' performances, preventing overfitting and seeing the assumptions of the models. By analyzing gender differences, this study aims to provide insights that could help improve self-assessment accuracy and educational interventions for students and professionals.

Methodology

The primary dataset for this study was from Study 3 of Ehrlinger et al.'s 2016 study, where they analyzed the relationship between overplacement (difference between a participant's estimated percentile score and their actual percentile score), gender, and intelligence theories. The study was in a lab setting with American undergraduate

college students, who took a questionnaire assessing their intelligence beliefs and a GRE-like exam afterwards. The participants were asked to estimate their performance post-exam. This dataset has two versions: one having gender as a variable and one without gender to compare the results.

The variables used in the study are intellectual theory, gender, attention, actual percentile score, and estimated. Intellectual theory measures the participants' responses by giving them a score; a lower score means the participants held an entity theory, and a higher score means incremental theory. The gender variable is categorized by M for male and F for female, attention is where the participants' attention was directed towards easy or hard problems post-exam review. Lastly, we measured the overplacement (overestimation of their score) by finding the difference between the variables actual and estimated percentile score the participant gave after reviewing the exam.

In this study, two regression models were created to assess the impact of gender on the relationship between intelligence theories and overconfidence (noted as variable Y). Model 1, E(Y | intel_theory, attn_to), excludes gender as an independent variable. In model 2, E(Y | intel_theory, attn_to, gender), gender is included to assess its role. We further analyzed the models by testing the models for a F distribution to compare the variability between the groups and analyzing the residuals to see if there was a significant linear relationship, determining whether or not gender influences overplacement. We evaluated model 1's assumptions: linearity, homoscedasticity (variability of errors or residuals remain consistent across the variables), normality of residuals, and no multicollinearity. A F-test was conducted to compare both models' to see if gender improved the model's fit, and the mean squared error and R-squared difference were calculated to see the impact of gender. We then used the whole sample to test model performance by calculating the in-sample loss through cross-validation to see if gender significantly improves model fit. Cross-validation helps reduce bias by looking at the whole data including the holdout sample, and it helps identify whether a model is too complex or simple. By comparing the linear regression of both models, the study provides a comprehensive assessment of whether or not gender impacts the relationship between intelligence theory,

attention condition, and overplacement.

Results

Model without Gender

The initial regression model E(Y | intel_theory, attn_to) examines the relationship without gender between overplacement (EstPerc - ActPerc), intelligence theory (intel_theory), and attention condition (attn_to). The model's
R^2 value was 0.02531, showing that there is only 2.5% variance in overplacement between intel_theory and attn_to.
By testing the model, we can see that the predictor variables are not significant; the mean squared error (MSE) is
800.3, which means the model is poor, as the data points are far away from the regression line.

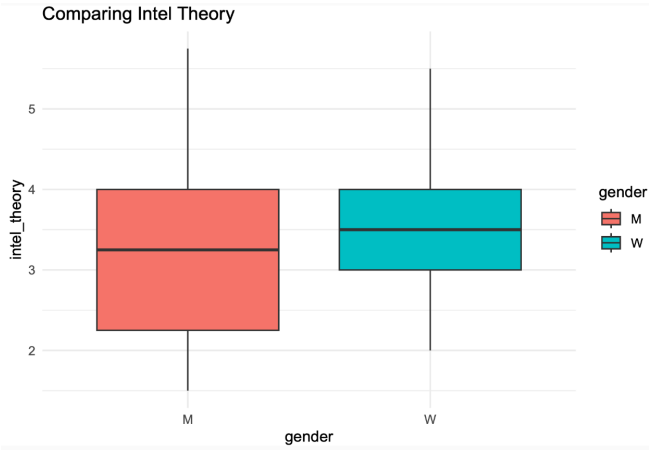

Fig. 1

Figure 1 compares the intellectual theory score between men and women from a questionnaire. The median in the intelligence theory between men and women are very close, and there seems to not be much of a difference. We see the differences in EstPerc and ActPerc with women having the tendency to have lower scores or lower overplacement. This suggests that gender does not play a significant role in intelligence theory scores, even though the distribution for men is wider. Through the cross-validation model, we tried to see if the results was better, but the MSE was 2842.218, showing that the cross-validation method did not show more significant results.

Model With Gender

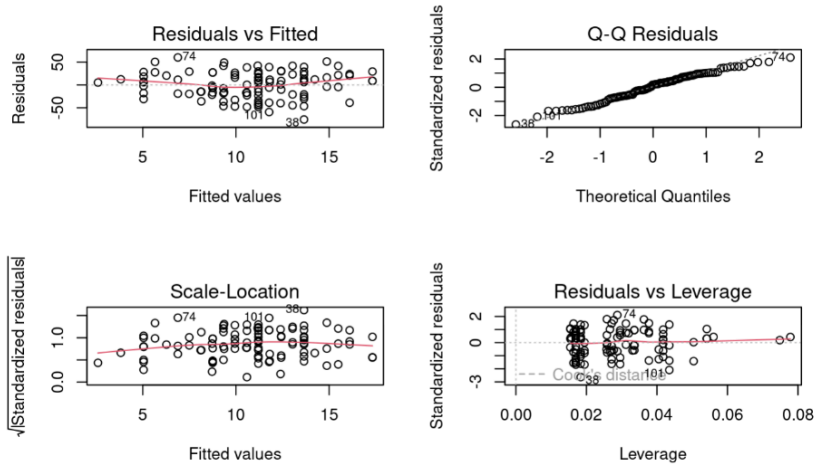

Fig 2.

In the 2nd model, we add gender as a predictor to improve model fit compared to the 1st model. The R^2 is 0.174,
showing 17.4% in variance for the variable overplacement. The gender variable has a p-value of 0.00098, meaning
that gender has a strong, statistically effect with women having a lower overplacement compared to men. The
intelligence theory shows a significant relationship with a p-value of 0.068, and the variable attention shows a
non-significant relationship with a p-value of 0.7281; meaning that intelligence theory may have an influence on
overplacement. The MSE for this model (678.1) is lower than the first model, showing that this model has a
significant improvement and more improved predictive accuracy of the F-test: gender influences overplacement.
Through the cross-validation model, we tried to see if the results was better, but the MSE was 2859.548, showing
that the cross-validation method did not show more significant results. We can see in Figure 2 that the residuals are not linear and do not follow the line, showing that this method is not a good fit. We also do an ANOVA test to test whether or not we reject the hypothesis, and the p-value was 0.0546, showing that there is not a significant relationship.

Discussion

Substantive Findings:

Individuals overestimate their abilities, which affects their decision-making, academic performance, and self-assessment. Overconfidence impacts one's attention to tasks, which can affect the learning process for students.
By creating two linear regression models, one with gender and one without gender, allows us to see whether or not

intelligence is a fixed trait or not and how it affects the overconfidence of one person. This study further seeks to answer the question: “Does gender affect the relationship between intelligence theories and overconfidence?” Their findings indicate that individuals who hold an entity theory tend to exhibit greater overplacement from selective attention for easier tasks.

Methods:

In this study, we utilized data from Study 3 of Ehrlinger et al. (2016): participants’ intelligence theory, gender, attention condition, overplacement (difference between actual and estimated test percentile) to make two regression models: one looking at overplacement without gender and exploring gender affecting overplacement. Graphical analysis and F-tests were used to fit the models and see the role of gender based on the in-sample loss measures between both models. Model 1 (without gender) shows that participants who see harder questions had lower overplacement scores. Model 2 (with gender) improves model fit with terms showing that gender moderates the effect of intelligence theory on overplacement. This was important to address this limitation, as it allows for both genders to be equal.

Implications:

Some individuals overestimate their abilities, but through this study, we see that there are significant insights into gender differences in overconfidence, especially for the self-assessment. The significant role of gender shows that men tend to overestimate their performance, while women tend to not overestimate. Women tend to underestimate their performance, which means that it can affect their academic performance. There could be interventions implemented by schools to boost the female students’ confidences. Overconfidence in a workplace helps men pursue more leadership roles, so organizations can create programs to allow for equally competent individuals to seek opportunities.We see that the second model fits the data well, and how intelligence and attention between genders contribute to one’s overconfidence leading to a higher overplacement.