

**Who's the Better Shot?**  
**Comparing NCAA Division 1 Women's and Men's Basketball**  
*An Executive Summary by Megan Lieb and Taylor Womack*

**Background:** We procured NCAA Division I Women's and Men's basketball data and performed statistical inference on it using multiple linear regression, prediction and confidence intervals, and effect size to compare and contrast men's and women's made free throw and 3-point percentages from 2012 to 2023.

**Methods:** Using R, we fitted full models using VARIABLES to predict free throw percentage and 3-point percentage separately. In the full models, the variables included were Position (three levels, categorical), G (number of games played, numerical), Class (four levels, categorical), Year (numerical), and Gender (two levels, categorical). We then computed confidence intervals for the difference between men's and women's average free throw percentage and average 3-point percentage. To determine predictive strength, we performed random forests on both datasets. To further investigate the effect gender has, we computed and compared effect size and effect size confidence intervals for Cohen's *d*, Hedge's *g*, and Glass's *delta* effect sizes. Finally, we computed a prediction interval for 3-point percentage for a NCAA D1 senior guard based on data from before the 3pt line shift and compared that to current 3-point percentages of Caitlin Clark and Shay Holle.

**Results:** In the free throw model, G ( $p < 2e-16$ ), Year ( $p = 0.400$ ), and Gender ( $p < 2e-16$ ) were significant. In the 3-point model, G ( $p < 8.89e-09$ ), Class (Fr.  $p = 0.0346$ , So.  $p = 0.0302$ , Jr.  $p = 0.0312$ , Sr.  $p = 0.0302$ ), and Gender ( $p < 2e-16$ ) were significant. For free throws, the random forests found that the feature importance impurity score for sex (male or female) was large compared to the score for class (fr, so, jr, sr) and position (guard, forward, center). The random forest for 3-point percentage found almost identical results, with sex having a much larger impurity score than both position and class. Additionally, a random forest examining the influence of the 3-point line shift in women's basketball found the distance of the 3-point line had a much lower impurity score than class and position. The prediction interval for the 3-point percentage of a senior guard before the 3-point line shift was between 28.4% and 44.8%. Caitlin Clark and Shay Holle's current 3-point percentages for the 2023-2024 season fall well within the prediction interval as they are shooting 39.9% and 34.7% from the 3-point line respectively. Cohen's *d* and Hedge's *g* both found that gender has a large effect on free throw percentage (both were 1.01); Glass's *delta* found a small to medium effect (0.30).

**Conclusion:** Men shoot at a higher 3-point percentage and free throw percentage than women in NCAA D1 basketball. The shift in the 3-point line did not seem to significantly influence the 3-point percentage of women when comparing two seasons of data before the shift to two seasons of data after the shift.