The Effect of Intelligence on Athletic Performance
David Roy and Christine Yew

## Introduction

Prior to the 2006 NFL Draft, Texas Quarterback Vince Young -coming off a historic Rose Bowl performance - caused a stir of controversy when he scored an abysmal 6 out of 50 on his Wonderlic intelligence test. Both NFL evaluators and NFL media members saw this as a red flag, questioning whether the Texas star would be unable to grasp the intricacies of NFL offenses at its most mentally demanding position. The concern over Young's intelligence ultimately proved irrelevant to NFL evaluators, for the quarterback was drafted third overall by the Tennessee Titans in the 2006 NFL Draft. ${ }^{1}$ Young also went on to win 2006-2007 Offensive Rookie of the Year honors. But the Young controversy raises the question: Does academic performance have an impact on athletic performance?

In our study, we will specifically look at the National Football League (NFL) for two reasons. First, the NFL has 53 players on each team's roster, which is greater than any other professional sport, and thus provides us with the greatest potential sample size. Second, the NFL provides the greatest wealth of data measuring intelligence because the Wonderlic intelligence test is given each year at the NFL Pre-Draft Combine to a pool of around 350 potential NFL players - some of whom will make the NFL and some of whom will not make the NFL.

Our study will investigate how much value NFL teams assign intelligence in their NFL Draft evaluations for prospective players at each position. We will also look at how much of an effect a player's intelligence has on his probability of making the NFL at each position.

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## Literature Review

McDonald P. Mirabile (2005) researched the relationship between intelligence, as measured by a player's Wonderlic score, and college statistical pass performance for the quarterback position only. He then investigated if there was a relationship between intelligence and compensation in the NFL for quarterbacks, while controlling for college passing performance. The dataset used by Mirabile was a compilation of 84 quarterbacks between 1989 and 2004.

Mirabile sets up two econometric models to measure the effect of intelligence on college passing performance. The dependent variable is college career passing efficiency in the first model and best college single season total offense in the second model. The key independent variable is the Wonderlic score and the control variables are height, forty-yard dash time, the number of offensive teammates drafted, the number of total teammates drafted. He also used a dummy variable for both level of competition (1=Division 1-A) and race (1=non-white).

Mirabile finds a statistically significant relationship between college passing performance and the number of teammates drafted and a quarterback's race. But the results show that the relationship between college passing performance and intelligence, as measured by Wonderlic score, to be statistically insignificant.

In the second part of his study, Mirabile investigates the determinants of NFL rookie salary for quarterbacks. As expected, there was a strong relationship between NFL rookie salary and college passing performance and also a strong relationship between NFL rookie compensation and expected NFL performance as measured by a quarterback's height, speed and previous level of competition. After controlling for quarterbacks' passing ability and
physical attributes, Mirabile finds no statistically significant relationship between intelligence and rookie compensation.

In another study, Sam Walker of the Wall Street Journal (2005) looked at the average Wonderlic score of each NFL team. The goal of his study was not only to identify which was the smartest team in football and which was the dumbest, but also to look for any correlation between the intelligence of a football team - measured by its average Wonderlic score - and its success on the field.

Using a cross-sectional data set of every NFL roster and each player's Wonderlic score at the start of the 2005 NFL season, Walker found that the smartest NFL team was the St. Louis Rams (24.6 average Wonderlic score) and the dumbest was the Green Bay Packers (19.1 average Wonderlic score).

Walker observed that the study's top four franchises - the St. Louis Rams, Tampa Bay Buccaneers, the Oakland Raiders and the Tennessee Titans - had each appeared in a Super Bowl in the past five years 1999-2004. The St. Louis offense alone, which had led the team to two Super Bowls, set an NFL record for total yards in a season and produced a three MVP awards from 1999-2005, averaged a score of 27 . A score of 27 is equivalent to that of the average chemist and engineer.

Walker suggests that a possible explanation for the increased importance of intelligence in football is the growing complexity of NFL schemes and playbooks compared to college football. Walker explains that "each player has to know instantly what to do, where his teammates will be going and how to adjust to the other team's behavior" for each different play call.

However, contradicting Walker's claim that intelligence matters in a team's success, the Rams, Raiders, Titans, and Buccaneers finished the 2005 season with a cumulative record of 25-39 and only one playoff berth among them.

Walker also used the same data on NFL players, but divided the data set by college or university, rather than by NFL team. Looking over the past seven years of NFL players entering the league, Walker found that Stanford (28.8) had the highest average score, while Miami (16.3) had the lowest score. Despite the low intelligence of its players, Miami was second only to Oklahoma in national football rankings from 2000-2004 and produced 22 first-round draft picks in 1998-2004. These results reinforce the lesser complexity of college schemes and the college game's greater emphasis on pure athletic ability.

Our paper aims to continue both Mirabile and Walker's study by looking at how Wonderlic scores affect the NFL success of individual players rather than whole teams. Additionally, we will look at positions beyond quarterbacks and use data from 2004 and 2005. Since our study includes all NFL positions, we will not use college statistical performance because of a lack of consistent statistical measures and skill set across positions, (i.e. it is difficult to compare the number of blocks made by centers to touchdown passes by quarterbacks).

## Model

We will be doing two separate econometric models. The first econometric model investigates how much value NFL teams assign the intelligence in their NFL Draft evaluations for prospective players:
$\mathrm{DP}=\alpha+\beta_{1}$ Wonderlic $+\beta_{2}$ Height $+\beta_{3}$ Weight $+\beta_{4}$ Speed $+\beta_{5}$ Agility $+\beta_{6}$ Strength $+\varepsilon$
where DP represents a player's draft position; Wonderlic represents a player's score on the Wonderlic test; Height is a player's height; Weight is a player's weight; Speed is a player's time in the 40 yard dash; Agility is a player's speed in a obstacle course cone drill; and Strength is the player's reps on the 225 pound bench press.

We will estimate a separate regression for each position because we expect different positions to require more intelligence than others. For example, quarterbacks are required to learn large playbooks and orchestrate the actions of 10 other players. In contrast, defensive lineman are mainly asked to simply get the quarterback. For quarterbacks, offensive lineman, inside linebacker, and free safeties, we expect $\beta_{1}<0$. For all other positions, we do not expect to be able to reject the null hypothesis that $\beta_{1}$ equals zero.

While in general we expect height, weight, speed, agility and strength to be positively correlated with each player's NFL Draft position and NFL success, we also expect the control variables to exhibit greater or lesser importance on different positions. For example, we expect height, weight and strength to be strongly correlated with the NFL Draft position and NFL success of all lineman including centers, offensive guards, offensive tackles, tight ends, defensive tackles and defensive ends. We expect speed and agility to be strongly correlated with all the skill positions' draft positions and NFL success. Skill positions include quarterback, running back, wide receiver, cornerback, safety and linebacker. For our control variables height, weight, speed and strength, we expect $\beta_{2}<0, \beta_{3}<0, \beta_{4}>0, \beta_{5}>0$, and $\beta_{6}<0$.

Our second econometric model looks at how much of an effect a player's intelligence has on his probability of making the NFL:

NFL $==\alpha+\beta_{1}$ Wonderlic $+\beta_{2}$ Height $+\beta_{3}$ Weight $+\beta_{4}$ Speed $+\beta_{5}$ Agility $+\beta_{6}$ Strength $+\varepsilon$
where NFL is a dummy variable in which 1 represents a player who has played an NFL game and 0 represents a player who never made it into an NFL game;

We will once again do a separate regression for each position because we expect different positions to require more intelligence than others. For quarterbacks, offensive lineman, inside linebacker, and free safeties, we expect $\beta_{1}>0$. For all other positions, we do not expect to be able to reject the null hypothesis that $\beta_{1}$ equals zero. For our control variables height, weight, speed and strength, we expect $\beta_{2}>0, \beta_{3}>0, \beta_{4}<0, \beta_{5}<0$, and $\beta_{6}>0$.

## Data

We use the 2004 and 2005 Wonderlic test to measure a player's intelligence. The Wonderlic intelligence test is a 12-minute and 50 question short version of the IQ test routinely given to kids, and thus the Wonderlic test scores range from a minimum of 0 to a maximum of 50 . The Wonderlic test is annually given to a pool of around 350 potential NFL players prior to entering the league at the NFL Draft Combine. We have a complete Wonderlic score data set data set for all players invited to the NFL Combine in 2004 and 2005.

The dependent variable in our first econometric equation will be a player's draft position in the 2004 and 2005 NFL Drafts. The format of the NFL Draft is an ordered selection process in which (barring trades) each of the 32 NFL teams selects one player during each of seven rounds. The order they select in depends on the team's record previous year, so that the worst teams choose first and the best teams choose last. We assume that each team desires the best player possible available when their draft position comes. Thus, the higher a player is drafted, the higher his value. There were a total of 255 selections in
both the 2004 and 2005 NFL Drafts, for a total of 510 draft picks over the studied time period. On the other hand, a total of 643 players were invited to the 2004 and 2005 NFL Combine. All undrafted players from the NFL Combine will receive a Draft score of 256.

The dependent variable in our second econometric equation will be the probability of whether players make the NFL or not. We will use a dummy variable in which 1 represents a player who has appeared in at least one NFL game during the 2004-2007 seasons and 0 represents a player who never made it into an NFL game.

We have a complete data set for all players invited to the NFL Combine in 2004 and 2005 for height, weight, and speed. The problem with our data set is that many of the player's invited to the NFL Draft Combine did not participate in the strength and agility drills. In order to fill in the missing data, we looked at those players who participated in every drill at the combine and then ran a multiple regression of our missing data category against all the other categories:

Agility $=\alpha+\beta_{1}$ Wonderlic $+\beta_{2}$ Height $+\beta_{3}$ Weight $+\beta_{4}$ Speed $+\beta_{5}$ Strength $+\varepsilon$
Strength $=\alpha+\beta_{1}$ Wonderlic $+\beta_{2}$ Height $+\beta_{3}$ Weight $+\beta_{4}$ Speed $+\beta_{5}$ Agility $+\varepsilon$
We ran two separate regressions for each of these equations, one for skilled players and one for unskilled players. Skilled players include the quarterback, running back, fullback, wide receiver, linebacker, and cornerback. Unskilled positions include center, guard, offensive tackle, defensive tackle, defensive end, tight end. We did this because the body types are vastly different across the two categories, so we assumed the relationships of physical attributes would also be different. As shown in Tables 2-5 in the Appendix Section, the t-statistics were especially strong for the relationship between agility in the cone drill and the known variables speed and weight. The t-statistics were also strong for the relationship
between strength in the 225 pound reps and the known variables weight and height of a player. We then ran a separate regression with just the strong t-statistic variables and then used the coefficients on 40 -time and weight to estimate the missing data cone drill speed and the coefficients on weight and height to estimate the missing data 225 bench press reps.

It can be argued that many players who choose not to participate in a drill are hiding a weakness in that drill and would score poorly. If this is the case, it seems plausible to average the estimate with the lowest score for the drill at that position. However, it can also be argued that many high-drafted players do not workout at the NFL Combine in order to protect their NFL Draft status and they would score very well in the drill. If this is the case, it seems plausible to average the estimate with the highest score for the drill at that position. Since it is impossible to distinguish between the two cases, we did not average the estimate with either a high or low score.

## Results

Our first econometric model looked at how the Wonderlic intelligence test affected a player's position in the NFL Draft:

## Table 1 - NFL Draft Linear Regression

## Statistical Significance and R-Squared

| Position | Wonderlic | Height | Weight | 40-Time | Agility | Reps | Adjusted R-Squared |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | ***-6.11 | -17.77 | 3.27 | 99.70 | 33.21 | -19.04 |  |
| QB | (2.10) | (20.84) | (9.09) | (122.34) | (65.94) | (50.01) | 0.30 |
|  | -0.13 | 3.29 | *** -2.99 | 194.36 | ***220.44 | -2.07 |  |
| RB | (1.97) | (5.57) | (1.05) | (125.56) | (75.27) | (4.06) | 0.32 |
|  | 0.58 | 15.66 | -2.67 | 395.69 | -3.61 | 2.53 |  |
| SS | (3.72) | (9.66) | (2.60) | (178.89) | (81.47) | (7.35) | 0.34 |
|  | 0.16 | 1.46 | *-2.40 | ***549.06 | 87.23 | 5.27 |  |
| FS | (2.76) | (4.91) | (1.29) | (176.33) | (78.10) | (4.78) | 0.46 |
|  | 1.06 | *-9.42 | -0.05 | ***362.34 | ***112.52 | -2.45 |  |
| WR | (1.53) | (5.32) | (1.18) | (83.04) | (45.65) | (5.47) | 0.39 |
|  | -0.62 | 8.14 | -0.29 | 296.48 | 93.00 | -3.34 |  |
| TE | (1.63) | (6.89) | (0.83) | (118.00) | (65.45) | (3.82) | 0.45 |
|  | -0.93 | -9.05 | -1.79 | **284.45 | *129.15 | 0.13 |  |
| OLB | (1.97) | (7.66) | (1.13) | (131.16) | (76.06) | (2.44) | 0.31 |
|  | 0.13 | 3.99 | -1.13 | ***205.92 | 48.17 | 1.74 |  |
| G | (2.00) | (5.53) | (1.26) | (69.52) | (60.26) | (2.49) | 0.34 |
|  | -0.82 | -0.02 | ***-2.03 | ***196.39 | -9.48 | -0.32 |  |
| OT | (1.65) | (1.92) | (.78) | (68.74) | (7.06) | (1.21) | 0.09 |
|  | 1.14 | 3.72 | ***-2.28 | ***216.47 | ***87.07 | -2.87 |  |
| DT | (1.34) | (5.70) | (0.87) | (86.13) | (38.35) | (1.92) | 0.32 |
|  | -0.83 | 3.39 | ***-2.80 | ***233.56 | ***101.89 | 0.28 |  |
| DE | (1.41) | (4.31) | (0.91) | (92.05) | (38.19) | (2.14) | 0.21 |
|  | 0.26 | 4.15 | -0.65 | 36.26 | ***217.13 | -2.63 |  |
| CB | (1.83) | (6.47) | (1.27) | (121.47) | (64.65) | (2.70) | 0.13 |
|  | 3.44 | 3.34 | -3.33 | 199.28 | 80.48 | 3.67 |  |
| C | (2.94) | (8.45) | (2.50) | (129.25) | (94.04) | (6.29) | 0.04 |
|  | 1.86 | 3.67 | ***6.71 | 95.30 | 37.57 | 0.07 |  |
| ILB | (2.87) | (5.72) | (2.62) | (149.30) | (83.01) | (2.98) | 0.35 |

***Statistically Significant at the $99 \%$ level
**Statistically Significant at the $95 \%$ level
*Statistically Significant at the $90 \%$ level
${ }^{\wedge}$ The quarterback data on reps had to be dropped because no quarterbacks at the NFL Combine participated in the drill, which means that reps were perfectly collinear with height and weight.
\#The fullback position was dropped due to lack of observations.
Table 1 divides the players by position and shows the coefficient value for each
estimated variable with its standard error listed below it in parentheses. The column at the far right displays the adjusted R-squared and also explains which variables are statistically
significant for each position, with a $* * *$ representing a coefficient that is significant at the $99 \%$ level, ${ }^{* *}$ representing a coefficient that is significant at the $95 \%$ level and $*$ representing a coefficient at the $90 \%$ level.

Quarterback was the only position at which we found statistical significance for the wonderlic test score with a coefficient of -6.11 , which means that for every extra point scored on the Wonderlic test, a quarterback's draft position dropped about 6 spots (which in the NFL draft represents an improvement of 6 spots). The adjusted $R^{2}$ was also a robust 0.3. This result is not that surprising and goes along with our hypothesis that quarterback is the most mentally demanding position. None of the other physical attribute variables were statistically significant for quarterbacks, which further cements the notion that quarterback is a cerebral position rather than a physical one.

In general, our model for a player's NFL Draft position yielded robust results. Out of 15 positions, 7 had an adjusted R-squared of at least 0.3 , which means that our independent variables explained at least $30 \%$ of the movement in a player's NFL Draft position. Interestingly, only one of the five lineman positions, guard, had an adjusted R-squared of more than 0.3 . This is surprising because lineman also do not have as transparent statistics as skill positions such as running back and quarterback, which brings into question what attributes on which NFL teams base their judgment of lineman.

A player's speed, as measured by his 40 -yard dash time, was the most common statistically significant control variable with it being significant at the $99 \%$ level for 10 out of the 15 of all positions both skilled and unskilled and is always a positive coefficient. We can conclude that speed is the variable that most explains movement in a player's draft position and that it is a positive relationship where the faster a player runs, the better (lower) his draft
position becomes. Both agility and weight were statistically significant at the $95 \%$ level for 6 out of the 15 positions. Height and reps explained movements in a player's draft position the least with only 2 out of the 15 positions statistically significant at the $95 \%$ level. '

Our second econometric equation looked at how a player's performance on the Wonderlic intelligence test affected whether he made the NFL or not.

## Table 2 - Logit Regression with Adjusted Coefficients

## Statistical Significance and R-Squared

| Position | Wonderlic | Height | Weight | 40-Time | Agility | Reps | Adjusted RSquared |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| All | *0.03 | -0.04 | ***0.05 | ***-4.23 | ***-2.49 | -0.04 |  |
| Players | (0.01) | (0.03) | (0.01) | (0.73) | (0.47) | (0.02) | 0.14 |
|  | 0.01 | -0.02 | ***0.04 | ***-4.25 | ***-3.03 | -0.01 |  |
| Skilled | (0.02) | (0.05) | (0.01) | (1.07) | (0.72) | (0.04 | 0.14 |
|  | *0.04 | -0.03 | ***0.05 | ***-4.66 | ***-2.16 | -0.04 |  |
| Unskilled | (0.02) | (0.04) | (0.01) | (1.11) | (0.65) | (0.03) | 0.15 |

***Statistically Significant at the $99 \%$ level
**Statistically Significant at the $95 \%$ level
*Statistically Significant at the $90 \%$ level

For the NFL dummy dependent variable, we performed a binomial logit regression. In general, binomial logit regressions work much better with large sample sizes (over 500 observations) due to the "maximize the likelihood" technique that produces normally distributed coefficient estimates. Since the position data has too limited a set of observations, we have split the regression results into three different groups in order to get larger sample sizes. The three groups are all positions, skilled positions, and unskilled positions.

The results of our binomial logit regression show that the Wonderlic test is statistically significant at the $90 \%$ level for all players and statistically significant at the $95 \%$ level for unskilled players. Before interpreting the coefficients of a binomial regression, we multiply the coefficients by 0.25 in order to get a get a rough estimate of the variable's coefficient. The Wonderlic coefficient for all players is 0.01 , which means that a one point
increase in a player's Wonderlic score increases the probability of that player making the NFL by $1 \%$. The Wonderlic coefficient for unskilled players is approximately the same as for all players at 0.01 .

Among the control variables, weight and time exert by far the greatest influence on whether a player makes the NFL or not. Both weight and time are statistically significant at the $99 \%$ level for all positions, skilled positions, and unskilled positions. The coefficient on weight for all three regressions was 0.01 , which means that a one pound increase in a player's weight increases the probability of that player making the NFL by $1 \%$. Thus, gaining 10 pounds can substantially increase the probability of a player making the NFL. The coefficient on 40 -time was -1.34 for all positions. This means that decreasing a player's 40 yard dash time by one tenth of a second will increase the probability of that player making the NFL by $13.4 \%$. Speed even at the level of a tenth of a second has a huge effect on the ability of a player making the NFL.

However, one caveat to our results is the low adjusted R -squared figures for all three regressions with a 0.10 for all positions, 0.10 for skilled positions and 0.12 for unskilled positions. Thus, our model generally does a poor job explaining whether a player plays in an NFL game or not, which reduces the robustness of our results.

We also did a Wonderlic mean comparison $t$-test for every position comparing the mean Wonderlic score of those players that made the NFL to the mean Wonderlic score of those players that did not make the NFL:

Table 3
2004 and 2005 All Positions Wonderlic Mean Comparison t-test For NFL Variable

| Position | Did Not Make NFL |  | Did Make NFL |  | Difference In Mean | t-statistic |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Mean | Observations | Mean | Observations |  |  |
|  | 24.49 |  | 28.32 |  |  |  |
| QB | (1.18) | 23 | (1.48) | 22 | -3.83 | -2.02 |
|  | 18.43 |  | 19.27 |  |  |  |
| RB | (1.36) | 14 | (1.10) | 36 | -0.84 | -0.43 |
|  | 19.88 |  | 19.2 |  |  |  |
| SS | (1.27) | 9 | (1.68) | 10 | 0.68 | 0.32 |
|  | 19 |  | 20.04 |  |  |  |
| FS | (1.27) | 7 | (1.14) | 25 | -1.04 | -0.41 |
|  | 18.16 |  | 19.14 |  |  |  |
| WR | (1.00) | 36 | (0.67) | 54 | -0.98 | -0.84 |
|  | 22.66 |  | 24.58 |  |  |  |
| TE | (2) | 9 | (2.11) | 24 | -1.91 | -0.52 |
|  | 19.2 |  | 21.97 |  |  |  |
| OLB | (1.47) | 15 | (1.10) | 35 | -2.77 | -1.43 |
|  | 22.66 |  | 25.12 |  |  |  |
| G | (0.99) | 15 | (1.33) | 26 | -2.45 | -1.28 |
|  | 23.53 |  | 24.39 |  |  |  |
| OT | (1.65) | 17 | (1.27) | 31 | -0.86 | -0.41 |
|  | 18.21 |  | 20.02 |  |  |  |
| DT | (1.64) | 14 | (1.35) | 40 | -1.81 | -0.72 |
|  | 19.70 |  | 20.41 |  |  |  |
| DE | (1.76) | 17 | (1.16) | 41 | -0.71 | -0.33 |
|  | 17.58 |  | 18.58 |  |  |  |
| CB | (1.80) | 12 | (0.83) | 51 | -1.00 | -0.52 |
|  | 27.86 |  | 28.87 |  |  |  |
| C | (1.28) | 7 | (1.75) | 16 | -1.02 | -0.36 |
|  | 23.33 |  | 20.75 |  |  |  |
| FB | (3.15) | 6 | (2.97) | 8 | 2.58 | 0.59 |
|  | 24.86 |  | 23.47 |  |  |  |
| ILB | (2.29) | 7 | (1.73) | 15 | 1.39 | 0.47 |
|  | 21.89 |  | 23.03 |  |  |  |
| Unskilled | (0.72) | 79 | (0.63) | 178 | -1.14 | -1.08 |
|  | 20.16 |  | 20.62 |  |  |  |
| Skilled | (0.54) | 129 | (0.41) | 256 | -0.47 | -0.67 |
|  | 20.81 |  | 21.61 |  |  |  |
| ALL | (0.44) | 208 | (0.36) | 434 | -0.80 | -1.33 |

The Wonderlic mean comparison t -test shows that quarterbacks are the only position that is statistically significant at the $95 \%$ confidence level. The means of the quarterbacks who made the NFL was nearly four full points higher than those who did not make the NFL.

Our robust results for quarterbacks' intelligence contradict Mirabile's (2005) findings that there was no statistically significant relationship between a quarterback's intelligence and his NFL rookie compensation, which is basically a proxy for NFL Draft position as the
better drafted quarterbacks get paid more. However, unlike Mirabile, we did not account for a quarterback's college passing performance statistics in our regression. Therefore, we will run a robustness test exclusively for quarterbacks that includes a quarterback's final college season's passing efficiency ${ }^{2}$ in order to control for a quarterback's college passing performance statistics:

## Table 4 - NFL Draft Linear Regression

## Statistical Significance and R-Squared

| Position | Wonderlic | Height | Weight | 40-Time | Agility | Reps | Passing Efficiency | Adjusted R-Squared |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | ***-5.02 | -10.7 | -0.49 | 81.39 | 16.81 | (dropped) | ***-2.37 |  |
| QB | (1.92) | (5.71) | (1.04) | (108.32) | (58.75) | $\wedge$ | (0.84) | 0.31 |

***Statistically Significant at the $99 \%$ level
**Statistically Significant at the $95 \%$ level
*Statistically Significant at the $90 \%$ level
${ }^{\wedge}$ The quarterback data on reps had to be dropped because no quarterbacks at the NFL Combine participated in the drill, which means that reps were perfectly collinear with height and weight.

The Wonderlic coefficient remains statistically significant at the $1 \%$ level even after controlling for a quarterback's college passing performance statistics. The point estimate of -5.02 suggests that for every extra point scored on the Wonderlic test, a quarterback's draft position improves by about 5 spots. This coefficient is slightly smaller than our original regression's Wonderlic coefficient, which suggests that there was an upward bias from the omitted college passing efficiency variable. As expected, passing efficiency was statistically significant at the $1 \%$ level, which makes sense because NFL teams evaluate players on their performance in games as much, if not more, than their NFL Combine measurements. The physical attribute variables remain statistically insignificant. Thus, our robustness test

[^1]reaffirms our previous result that a quarterback's intelligence is a strong determinant of his NFL draft position.

## Conclusion

The results of our paper suggest that intelligence only has a statistically significant effect on a player's NFL Draft position for the quarterback position. At all other NFL positions, it appears intelligence does not play an important role in NFL teams' draft evaluation of a player or a player's success in playing in an NFL game.

The Wonderlic coefficient remained statistically significant in our robustness test controlling for a quarterback's college passing performance. Based on our estimates, a onepoint increase in a quarterback's Wonderlic score bettered (lowered) his NFL Draft position by approximately 5 spots. In other words, controlling for other physical attributes (height, weight, strength, speed and agility) as well as college passing performance, NFL teams valued smarter quarterbacks more than lesser intelligent quarterbacks.

Our results contradict Mirabile's (2005) findings that there was no statistically significant relationship between a quarterback's intelligence and his NFL rookie compensation, which is basically a proxy for NFL Draft position as the better drafted quarterbacks get paid more. Our conclusion is that our slightly updated data from the 2004 and 2005 NFL Drafts, as opposed to the 1989-2004 dataset Mirabile used, shows a shift in NFL teams' criteria for quarterbacks' evaluations with a greater emphasis on intelligence. The fact that the number one draft pick in both the 2004 and 2005 NFL Drafts were highly intelligent quarterbacks Eli Manning (Wonderlic score of 39) and Alex Smith (Wonderlic

Score of 40) supports this hypothesis. Potential future research in the field could investigate if this trend continues in the 2006, 2007 and 2008 NFL Drafts.

## Appendix

## Table 1

## 2004 and 2005 All Positions Wonderlic Summary Statistics

| Position | Observations | Mean |  | Standard <br> Deviation |  | Minimum |  | Maximum |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| QB | 45 |  | 26.35 |  | 6.57 |  | 11 |  |
| RB | 50 |  | 19.04 |  | 6.19 |  | 6 |  |
| SS | 19 |  | 19.52 |  | 4.56 |  | 13 |  |
| FS | 32 |  | 19.81 |  | 5.28 |  | 10 |  |
| WR | 90 |  | 18.75 |  | 5.38 |  | 9 |  |
| TE | 33 |  | 24.06 |  | 9.30 |  | 9 |  |
| OLB | 50 |  | 21.14 |  | 6.35 |  | 10 |  |
| G | 41 |  | 24.21 |  | 5.94 |  | 13 |  |
| OT | 48 |  | 24.08 |  | 6.93 |  | 7 |  |
| DT | 54 |  | 19.55 |  | 8.01 |  | 8 |  |
| DE | 58 |  | 20.21 |  | 7.31 |  | 3 |  |
| CB | 63 |  | 18.39 |  | 5.94 |  | 6 |  |
| C | 23 |  | 28.56 |  | 6.05 |  | 19 |  |
| FB | 14 |  | 21.85 |  | 7.92 |  | 10 |  |
| ILB | 22 |  | 23.91 |  | 6.39 |  | 12 |  |

## Graph 1 - Histogram of Wonderlic Scores for All Positions



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[^0]:    ${ }^{1}$ Before the 2006 NFL Draft, Young re-tested with a score of 16, quelling some of the concern over his mental abilities.

[^1]:    ${ }^{2}$ Passing Efficiency is an overall measure of a quarterback's passing performance that weights four different passing statistics: completion percentage, yards per attempt, touchdowns per attempt, and interceptions per attempt. The equation is:
    Passing Efficiency $=(($ COMP/ATT $) \times 100)+((\mathrm{YDS} / \mathrm{ATT}) \times 8.4)+(\mathrm{TD} / \mathrm{ATT}) \times 330-((\mathrm{INT} / \mathrm{ATT}) \times 220)$

