Oregon State Student Athlete Academic Performance Compared to that of the General Undergraduate Population

by
Joely Hannan

A THESIS

submitted to

Oregon State University

Honors College

in partial fulfillment of
the requirements for the
degree of

Honors Baccalaureate of Science in Biochemistry and Biophysics
(Honors Scholar)

Presented June 1, 2017
Commencement June 2017

AN ABSTRACT OF THE THESIS OF

Joely Hannan for the degree of Honors Baccalaureate of Science in Biochemistry and Biophysics presented on June 1, 2017. Title: Oregon State Student Athlete Academic Performance Compared to General Undergraduate Population.

Abstract approved:_____

David Berger

Academic performance of student athletes is an of interest topic in the current climate of rising university athletics expenses. This project academic population of Oregon State University student athletes with that of the general undergraduate population using grade point averages (GPA). Samples were compared using team, gender, college, and sport season. College preparedness assessed using high school GPA and SAT scores. As a whole, student athletes do not perform statistically differently than their peers, but differences arise when they are broken into subgroups. Female student athletes performed better academically than female non-athlete peers, while males underperformed relative to the general population. In-season schedules did not have a significant impact on academic performance, though athletes are more likely to take credits online or aggregate into majors differently than the general population, particularly within Liberal Arts, Business, or Public Health and Human Sciences. While some subgroups of college athletes may have below average performance in college, the gap between them and

their peers at the university level compared to the high school level becomes narrower, showing that academic support programs and culture may influence personal improvement among athletes.

Key Words: Student Athlete, Academics, Academic Performance

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I understand that my project will become part of the permanent collection of Oregon State University, Honors College. My signature below authorizes release of my project to any reader upon request.

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Joely Hannan, Author

Acknowledgements

First and foremost, thank you to my mentor, Dr. Dave Berger, who bravely took on a Biochemistry student that had never taken a Business class before registering for Thesis credits. Your guidance and support allowed me to develop a project that highlights some of the best parts of my college experience. Additionally, the endless line of help I received from the Oregon State Athletic Department and my academic advisors as I developed this project, especially from my committee members Dr. Kate Halischak and Dr. Andy Karplus, was invaluable. Thank you to Dr. Kate especially for helping me immensely in obtaining all this data and processing it in a way that made this project possible for me! Furthermore, thank you to my teammates and coaches for making my experience as a student athlete so meaningful. Finally, thank you to my roommate Teresa Peterson, because without your support and friendship, who knows if I would have become a student athlete at all!

Go Beavs!

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Introduction

Motivation for This Thesis

As a student athlete on the women's rowing team at Oregon State University, I have had invaluable experiences training and competing that have enriched my college career and motivated me to push my limits across other disciplines in my life. I was a member of the Student Athlete Advisory Committee, and a subgroup of that committee and I looked through a series of articles published by the *Washington Post* discussing some negative viewpoints about rising costs of athletics programs at universities. Some of these articles felt contradictory to my own experience and lead me to seek out a project studying the lives of student athletes off of the field.

Athletics as a Part of College Culture

University athletics is an engrained portion of college culture, contributing to many social aspects of the college experience. Athletics is often one of the most visible aspects of a university. News outlets likely do not cover the current happenings of university departments as frequently as collegiate athletics teams results are broadcasted in sports reports. Moreover, in the United States, it is common for alumni to make sporting events of their alma mater a focal point of social interactions, shaping culture even beyond time at a university (Chung, 2013).

Athletics is a significant revenue generator for universities. Combined income of the forty-eight reporting athletic departments in the Power Five conferences was a total of $4.49 billion (Rich, 2016). However, although the revenue is high, expenses of Division I athletic programs are growing faster, causing a large

amount of NCAA athletic departments to take subsidies from their universities. Increased media attention has been focused on athletics contribution to a university, especially as related to athletics spending and the idea of whether college athletes are worth this significant financial investment.

Athletic success has been historically shown to improve the overall success of the university. For example, in *The Flutie Effect*, Johnson discusses a phenomenon in which a quarterback named Doug Flutie played a major role in turning around the success of Boston College's football program. The success of the football program allowed for more televised games, which was eventually followed by a rise in souvenir sales and an increase in applications to the university. This phenomenon is often referenced in defense of athletics growth. Money spent on the field may contribute to the overall growth and visibility of a university. University of Alabama has played in five of the last eight College Football National Championships, and won four. Interestingly, they also have the highest number of national merit scholars in the United States (Getz, 2014). Coinciding with this period of football success, Alabama has seen undergraduate enrollment increase thirty-three percent since 2007. Students with lower scoring SATs are more likely to be attracted to a university and influenced to apply by athletic success than higher scoring peers, but an attractiveness factor of athletic success was present in both pools (Chung, 2013).

Student Athlete Experience

Due to the prominent impact of athletics on a university's image, particularly in Power Five Division I schools, the lives of student athletes are often in the limelight. Lives of student athletes can be different than those of their

undergraduate peers. They experience pressures to perform on the field, to appear as leaders on campus, and excessive time demands placed on them by their athletic coaches and staff. Additionally, they often serve as ambassadors or are looked at as role models within a university environment because of their athletic association.

College is a time for major young adult development and change, and these pressures may be both positive and negative. In a study of Division III student athletes, hours per week spent in class or studying did not vary from athletes to non-athletes (Richards, 1999). However, time spent in extracurricular activities, such as practice or games, was significantly higher than students involved in other activities, such as broadcasting or performing arts. Additionally, athletes that are on scholarship in a sense could be considered "employees" of the university, motivating them to have disproportionate interest in their sports over academic endeavors due to a role conflict between being a student, but having their athletic pursuits foot their academic bills (Purdy, 1982).

The majority of athletics media coverage surrounds the competition and successes of teams and players. However, scandals surrounding athletics departments, negative behaviors of one athlete for example, can make a much bigger splash than the much more collective effort of a single team training and competing to move their program forward. Unusual instances of poor behavior, violations of amateurism, or academic fraud as a mechanism to maintain the eligibility of athletes sometimes dominate the conversation surrounding university athletics. This often contributes to an overall unconstructive, poor stereotype

surrounding student athletes that resonates into opinions of their academic performance.

Baucom and Lanz (2001) addressed faculty perceptions of male student athletes at a Division II university using a Situational Attitude Scale, addressing the likelihood of situations at the institutions on a five-point survey scale. Ten situations were presented including that a male student athlete was on scholarship, misses class, or decides to take their program at a slower pace. The study found that many faculty had the perception that on average, student athletes were below par academically and may have been treated differently during the admissions process, even when their school had data to suggest otherwise. They also often believed that nearly all student athletes received full scholarship and that goals of college athletic programs did not align with university values of academic excellence or integrity. Athletes have often reported challenges in feeling as though they are taken seriously by their professors, which may negatively impact their motivation toward scholastic achievement as well as erode confidence in their own academic abilities (Richards, 1999).

It is reported that athletes likely are motivated by different priorities than their peers in high school with similar college aspirations (Hildenbrand, 2009). While they must maintain admission worthy grades for college acceptance, they also must focus immense energy and time into the recruiting process. This time spent interacting with coaches and seeking out collegiate athletic positions and scholarships is a unique challenge compared to that of their other college bound peers. Additionally, once they are accepted into a college program, mental focus may

be that they are going to college for their sport, rather than thinking extensively about a particular field of study. Indeed, some even believe that in some instances, "Sport Performance" should be a university major, similar to an artist or dancer attending a specialized school in which to refine their craft (Jenkins, 2011).

As a college athlete myself, my personal experiences motivated my interest in the public perception of athletics. I walked on to the Women's Rowing team at Oregon State University and have gained invaluable life skills, relationships, and opportunities from the experience. As a member of the Student Athlete Advisory Committee, I was involved in a subgroup that discussed a series of articles that had various critiques of athletics departments. In particular, we focused on how often these types of articles did not include the voices of student athletes, the players that drive it all. While I recognize that my viewpoint may be biased, the athletes I have been surrounded with the last four years have appeared to me as high achieving, determined, goal oriented individuals. An observable difference may be that interest in sport science, sport psychology, sport marketing or other "sport" involved fields may attract more athletes than characteristic of the university population, but my personal observations saw my fellow athletes often thriving in their choices. I wanted to see how these observations held up in actuality with respect to how athletes perform beyond their field, court, or course.

Studying Academic Endeavors of Student Athletes

Culture is defined as the attitudes and behaviors characteristic of a particular social group (Merriam-Webster, 2017). As with any such group, unique cultures

and values exist within sports teams. Team culture can be a driving factor for academic performance. Several Division I institutions have implemented a "Scholar-Baller" system, that allows athletes to receive patches for academic performance on jerseys or other gear. Such programs have seen an increase in academic persistence within athletics teams (Harrison, 2010). This system encourages student athletes to embody both the pop culture term "baller," relating to their athletic prowess and character, as well as being a "scholar" and putting care and attention toward their scholastic efforts. Without marked emphasis on academics, student athletes may approach academics more passively, despite their characteristic competitiveness on the field, due to a unique social cultural climate within athletics (Pascarella, 1999).

Regardless of their perceptions of academic importance, there are many support systems for student athletes at most Division I institutions. Tutoring programs are often available for student athletes to assist with missing class as a result of travel for competition or alleviate challenges faced by demanding practice schedules.

Hildenbrand et al. (2009) discovered that athletic status, while potentially causing students to advance through college more slowly due to taking fewer credits per term, was positively associated with odds of graduating, and a 0.197 increase in cumulative GPA. Additionally, athletes that did drop out of college completed about one semester more prior to termination of enrollment than non-athlete individuals who also dropped out. Therefore, athletic involvement showed a positive effect on the academics of student athletes across the universities tested.

The United States Air Force Academy conducted a study surrounding integration of student athletes with their peers across a relatively standardized curriculum, in which students do not chose their own class schedules. Their study showed that student athletes performed on par with predicted levels of performance based on metrics applied to all students (Payne, 2014). Therefore, athletic participation did not significantly affect the academic success of students at the Air Force Academy.

Data quality for studies of this nature has presented a challenge for studies in the past (Hildenbrand, 2009). Studies often require universities to self-report, causing reliability and accuracy to be variable. FERPA laws protect academic data, thus the where and how that data surrounding academics can be released is limited. At smaller universities, it is often not possible to analyze data by specific teams due to their small sample pools (Richards, 1999).

Factors that influence a student athlete's dedication to academics are often not isolated to simply their athletic status. Other factors, such as belief that their first year post-graduation will be dedicated to their sport, pre-conceived ideas about the importance of graduating, choice of major, or need to work hours at a job for pay may significantly alter one athlete's academic performance relative to another (Beron, 2016). Differences in college preparedness may be one of the most significant factors contributing to athlete's academic performance, which can further be correlated with gender, race, and quality of high school (Eitzen and Purdy, 1986; Valleser, 2014). Similar factors influence the academic performance of non-athlete undergraduates as well.

This study seeks to further the body of research on student athlete academic performance by determining how student athletes perform relative to the general undergraduate population at Oregon State University. Possible outcomes include that the exceptional time demands caused by their athletic participation could contribute to a lower level of athlete academic performance relative to their undergraduate peers. In contrast however, participation in sports may instill character traits such as time management, which, in conjunction with academic support programs for athletes, may improve student athlete academic performance relative to their peers.

Methods

Data for this study were obtained with permission from the Academics for Student Athletes department at Oregon State University. Oregon State University is an NCAA Division I with typically around 440 on-roster student athletes within 17 sports. Grade point average (GPA), which is based on a 4.0 scale (Supplemental 1), was recorded over 15 terms from Fall 2011 through Spring 2016 by team and by college for all student athletes. The average values were obtained from Dr. Kate Halischack, the Director for Academics for Student Athletes. The College of Business, College of Public Health and Human Sciences, and College of Liberal Arts were used for individual analysis because they have the largest number of enrolled student athletes of undergraduate colleges. Other colleges were omitted from individual analysis to prevent the presence of personal identifiers during the data collection.

Anonymity of student athlete individuals was maintained in the data collection and analysis.

Athletic data was compared to the Non-Athlete General Undergraduate population using University Registrar data provided by Dr. Halischack. Additional data for incoming freshmen was obtained by Institutional Research Enrollment Summaries published online by the university. The comparator general student population was Corvallis campus undergraduate students attempting 12 or more credits. Summer term data were not used, as significantly fewer undergraduates enroll in credits this term.

Results and Discussion

GPA Differences Between Student Athletes and General Undergraduates

The first analysis sought to compare student athletes across the entire university with their general undergraduate peers in order to establish a general understanding surrounding any differences in performance. This included the entire population of student athletes, male and female student athletes, and individual team GPAs relative to the entire undergraduate population at Oregon State. Data spanned from Fall 2011 to Spring 2016. The average undergraduate GPA during this time period was 3.09. The average student athlete GPA was 3.08. The difference from the general undergraduate was then found by subtracting the average athlete GPA from the average undergraduate GPA.

Table 1 includes average GPA for each student athlete group and the standard deviations during this time period. It also describes the size of the

differences between the group and the general population, either positive or negative. Term-by term averages were then compared using a two-sample T-Test to determine if the variation between groups was statistically significant at the 10% level.

As a combined population, student athletes do not perform significantly different than the general undergraduate population at Oregon State, with a -0.01 difference and a P-value of 0.54, shown in Panel A. Therefore, the combined population failed to reject the null hypothesis. When broken into gender groups, however, greater variation became evident. Males were 0.15 GPA points below their peers, but females outperformed their peers by 0.06 GPA points. Therefore, while the margin was smaller, female athletes demonstrated higher levels of academic success than their male counterparts. The P-values for males and females were both significant, suggesting strong differences between athletes and their peers of the same gender.

Seven of the ten female teams had GPA exceeding the general female undergraduate GPA: Cross Country, Golf, Soccer, Volleyball, Basketball, and Gymnastics, Rowing and Track. Swimming matches the general undergraduate GPA and also has an P-value above 0.10. Two teams are exceptions to the commonly observed higher performance of female athletes, with Women's Basketball 0.27 GPA points below their non-athlete peers and Softball 0.29 points below.

Of higher performing teams, Women's Cross Country has the largest positive margin, earning 0.36 points above their female non-athlete peers. The size of the difference was less observable earlier in the obtained data because prior to Fall

GPA Difference over 5 Year Time Period

Panel A: Combined Student Athlete Population

Group	Average GPA	Standard Deviation	Difference from General Undergraduate*	P-Value
Total Combined	3.08	0.27	-0.01	0.536
Male Athletes	2.87	0.20	-0.15	0.000
Female Athletes	3.23	0.21	0.07	0.004

Panel B: Female Sports By Team

Team	Average GPA	Standard Deviation	Difference from General Undergraduate*	P-Value
W Cross-Country	3.53	0.15	0.36	0.0000
W Golf	3.19	0.20	0.03	0.523
W Soccer	3.31	0.15	0.15	0.002
W Volleyball	3.32	0.11	0.16	0.001
W Basketball	2.89	0.27	-0.27	0.002
W Gymnastics	3.32	0.18	0.16	0.004
W Softball	2.87	0.19	-0.29	0.000
W Swimming	3.17	0.09	0.00	0.811
W Crew	3.25	0.06	0.09	0.000
W Track	3.38	0.15	0.22	0.000

Panel C: Male Sports By Team

Team	Average	Standard Deviation	Difference from General Undergraduate*	P-Value
M Football	2.66	0.17	-0.37	0.000
M Soccer	3.04	0.10	0.01	0.734
M Basketball	2.64	0.21	-0.38	0.000
M Wrestling	2.78	0.11	-0.25	0.000
M Baseball	2.88	0.14	-0.14	0.003
M Crew	2.94	0.06	-0.09	0.000
M Golf	3.16	0.19	0.14	0.016

*Difference defined by (Athlete GPA-Undergraduate GPA)

Table 1. GPA differences of the student athlete and general undergraduate population are described using average team GPA, standard deviation of team GPA, and then difference between the average corresponding undergraduate populations by gender. The two-sample T-Test was used to determine statistical significance at the 10% level.

2014, Women's Cross Country and Track were coded together in the Academics for Student Athletes system. Several athletes are on the roster for both sports, as the seasons are at different times. Historic roster data was inaccurate and made separating the data before the split imprecise. Therefore, for Fall 2011 through Spring 2014, Women's Cross Country and Track share the same data, which does impact their individual sport calculations within this analysis. Following the split, Women's Cross Country GPA was 0.10-0.39 GPA points higher than Women's Track, showing a marked difference between the two teams.

Men's Golf achieves the highest GPA of male teams, 0.14 points above their male non-athlete peers. However, they also have a larger standard deviation, at 0.19, than the majority of other teams. Golf has a small roster, with only nine athletes starting the 2016-2017 academic year. Therefore, oscillation in their data is more likely than large roster sports. Men's Soccer was the only other team performing above their non-athlete peers, with a 0.01 point difference and their team P-value fails to reject the null ($P>0.10$). The remaining male teams: Football, Basketball, Wrestling, Baseball, and Crew all performed below their peers. The largest differences occurred for Football, at -0.37 points, and Men's Basketball, at -0.38 points. It is notable that these two teams are the largest revenue driving sports for the majority of Division I institutions.

Overall, when comparing student athletes with the general undergraduate population, the largest difference between the groups appears when separated by gender. A few teams show exceptions, but the majority of the athlete population, when compared to their peers of the same gender are significant below the 10%

level. This difference could be driven by sociological reasons that male and female athletes chose to pursue university athletics, particularly on scholarship. Earning potential as male professional athletes is typically higher than that for females, therefore female athletes may see their academic performance as more central to their professional futures.

Comparison By College of Student Athletes and General Undergraduates

College athletes may chose majors differently than a typical college bound student, based on interest in sport related topics, schedule flexibility and overall time demands. The distribution of Oregon State student athletes across colleges is shown in Table 2.

Winter 2016 Student Athlete College Enrollment

College	Number Enrolled	Percent (%)
Agricultural Sciences	14	3.2
Business	72	16.3
Education	5	1.1
Engineering	44	9.9
Earth, Ocean, and Atmospheric Sciences	2	0.5
Forestry	7	1.6
Graduate School	2	0.5
Liberal Arts	100	22.6
Public Health and Human Sciences	96	21.7
Science	28	6.3
Exploratory Studies	78	17.6
Honors College	10	2.3

Table 2. Distribution of Student Athletes Across Colleges. From a total of 443 student athletes enrolled in Winter 2016, the number of student in each college and the overall percent of athletes is shown.

To further investigate the differences found in Table, 1, the following analysis used data comparing student athletes in their respective colleges with undergraduate peers in the same college. The College of Liberal Arts, College of Business, and College of Public Health and Human Sciences were used because of their larger number of athletes enrolled. Due to the significant differences demonstrated in Table 1 between academic performance of males and females, this data set was also separated by gender. Table 3 depicts the average GPAs and standard deviations for athletes in their respective college and uses the same formula for calculating the difference from general undergraduate peers and the two-sample T-test as Table 1.

Athlete GPA Difference over 5 Years By College

Panel A: Combined Student Athlete Population				
College	Average GPA	Standard Deviation	Difference from General Undergraduate	P-Value
BUS	3.05	0.08	0.11	0.001
PHHS	3.04	0.07	-0.10	0.000
CLA	2.88	0.10	-0.20	0.000
Panel B: Female Student Athlete Population				
College	Average GPA	Standard Deviation	Difference from General Undergraduate	P-Value
BUS	3.20	0.11	0.20	0.000
PHHS	3.28	0.06	0.04	0.035
CLA	3.15	0.12	-0.03	0.316
Panel C: Male Student Athlete Population				
College	Average GPA	Standard Deviation	Difference from General Undergraduate	P-Value
BUS	2.91	0.13	0.03	0.509
PHHS	2.80	0.12	-0.44	0.000
CLA	2.62	0.13	-0.36	0.000

Table 3. GPA Difference over Five Years By College. This Table demonstrates the differences between student athletes and their general undergraduate peers in the College of Business (BUS), College of Public Health and Human Sciences (PHHS), and College of Liberal Arts (CLA). Panel A shows combined pools of males and females, Panel B is female athlete against female non-athletes, and Panel C is the same for males. Average GPA and standard deviation is shown, along with Difference from the General Undergraduate (Average Athlete GPA-Average Undergraduate GPA), and the two sample T-Test.

From this analysis, College of Business student athletes are shown to outperform their peers in each group. The total athlete pool performed 0.11 GPA points higher the other Business students. Females outperformed their Business peers by the largest margin, at 0.22 GPA points. Male athletes bested their College of Business peers by 0.03 GPA points. However, the finding that athletes perform better is weaker in the males, due to the statistically insignificant P-value of 0.509, whereas the female pool showed a P-value, below 0.01, indicating a clear difference.

Athlete success within the College of Business could be partially due to professional development programs within the athletic department designed to help athletes transfer their sport skills into the workplace environment. Furthermore, sport skills and team dynamics learned through athletics can be particularly useful in the team based, group project environment often present in business classes.

Athletes in the College of Liberal Arts perform below their other peers across categories. However, the P-value for female Liberal Arts students is above 0.10, showing insignificant variability between female athlete and non-athlete students in this department. Liberal Arts enrolls the highest number of athletes of the undergraduate colleges at Oregon State, at 100 of 443 total athletes, or 22.6% as of Winter 2016, shown in Table 2. It is proposed that, athletes may choose majors in this department due to more flexible schedules (Burke, 2016).

The College of Public Health and Human Sciences could be attractive to student athletes due to their likely innate interest in kinesiology, fitness, and health. The pattern of positive differences between female athletes and their peers, 0.04

GPA points with a P-value of 0.0353 held within this department. Additionally, a statistically significant negative difference for males was also shown in this College. These finding align with differences shown in Table 1.

Seasonality Comparison

Travel and game play can significantly affect an athlete's schedule during their athletic season. The NCAA has different restrictions on mandatory hours between in season and out of season training. In season schedules include up to twenty mandatory hours of practice and play per week, not including additional time spent in the athletic training room or other similar activities. Out of season schedules include eight hours of mandatory conditioning, two of which can be specific skill practice, but often include voluntary conditioning up to a similar time volume as in season schedules.

Teams may be at their "in season" mandatory hour limit for varying amounts of time before their respective seasons. Some sports have a main season that leads to conference and championship play, but also compete in another season. For example, Men's and Women's Soccer's main season and conference championship is in fall, but they participate in spring play. For this analysis, the term in which each sport missed the most days of class was denoted as the "in season" term. There is some variation in this, as some sports have play in more than one term.

Due to in season time demands, and the time spent away from class due to traveling for competition, there is potential for recognizable differences between when athletes are in and out of season. Table 4 documents the difference between in

and out of season terms for all teams, different season sports, and ultimately team-by-team, using the two-sample T-test was used to compare variance between these terms. Standard deviations are included for each season grouping. Panel A shows the self-comparison of teams to themselves between seasons, whereas Panel B presents the differences from the general undergraduate in season versus out of season.

This analysis demonstrated that GPA from out of season terms was not particularly variable from in season terms. The combined student athlete population performed 0.029 GPA points lower during in season terms, but 6 of 17 teams actually outperform their point estimate out of season GPA, contributing to the overall insignificant statistical variance. Furthermore, for almost all teams, the P-values continued showed no significant variance. The only deviation occurred for Men's Baseball, where in season GPA is 0.21 GPA points lower than in season, with a P-value of 0.0008, indicating that their team rejects the null hypothesis and shows a noteworthy difference between seasonality.

Potential variables leading to academic success during in season play could include student athletes taking fewer credits or less challenging courses for these terms to accommodate for the challenges that travel and competition add to their schedules. Prior research in this area showed that females and males chose to take a similar number of credits during their athletic season, but males may chose to take classes perceived as a lower "academic load" during their season (Vallesar, 2014).

In Season versus Out of Season GPA

Panel A: Comparison of Team GPA In Season and Out of Season

Team	Self Comparison In Season and Out of Season Terms	P-value	Average Difference In-Season to General Undergraduate	Average Difference Out of Season from General Undergraduate
All Teams	-0.03	0.530	-0.04	-0.02
Fall Sports	-0.02	0.810	0.07	0.05
Winter Sports	-0.02	0.803	-0.19	-0.16
Spring Sports	-0.03	0.659	0.01	0.06

Panel B: Comparison of Male Teams in and Out of Season

Team	Self Comparison In Season and Out of Season Terms	P-value	Average Difference In-Season to General Undergraduate	Average Difference Out of Season from General Undergraduate
M Baseball	-0.21	0.001	-0.29	-0.07
M Basketball	-0.05	0.718	-0.42	-0.37
M Crew	-0.03	0.342	-0.12	-0.07
M Football	-0.01	0.934	-0.36	-0.37
M Golf	0.05	0.723	0.16	0.13
M Soccer	-0.02	0.738	0.01	0.01
M Wrestling	0.03	0.691	-0.23	-0.26

Panel C: Comparison of Female Teams In and Out of Season

Team	Self Comparison In Season and Out of Season Terms	P-value	Average Difference In-Season to General Undergraduate	Average Difference Out of Season from General Undergraduate
W Basketball	-0.07	0.853	-0.26	-0.28
W Crew	0.00	0.342	0.07	0.09
W Cross Country	-0.06	0.629	0.35	0.37
W Golf	-0.03	0.791	0.03	0.03
W Gymnastics	-0.14	0.247	0.06	0.21
W Soccer	-0.04	0.660	0.15	0.15
W Softball	0.00	0.9762	-0.30	-0.29
W Swimming	0.00	0.9567	0.00	0.01
W Track	0.05	0.6409	0.24	0.21
W Volleyball	0.04	0.4175	0.21	0.13

Table 4. In Season Versus Out of Season Comparison. The average difference between in season and out of season GPA by sport was calculated and the two-sample T-test was used to compare the variation between them. The third and fourth columns reflect the variation in in and out of season terms from the general undergraduate average for those terms.

Student Athletes and the Online Student Population

In order to manage demanding practice schedules and time away due to travel, student athletes may opt to take a higher proportion of credits online than the typical Oregon State University student. Opting to take online classes may be a method for athletes to adapt their class schedules and maintain academic performance while in their athletic season. Table 5 shows the percentages of credits earned online by student athletes overall and when they are in season. The two-point T-Test is used to compare the proportions of online credits earned by athletes to the total average earned online from Oregon State.

Proportion of Credits Earned Online By Student Athletes

Sport	Average Credits Online (%)	Average Credits Online In-Season (%)	P-Value against General Undergraduate
W Basketball	26.02	32.36	0.000
W Golf	28.09	32.64	0.000
W Gymnastics	20.11	28.16	0.001
W Rowing	16.88	18.16	0.025
W Softball	42.34	47.60	0.000
W Soccer	24.80	30.30	0.000
W Swimming	18.09	21.16	0.009
W Cross Country	9.93	9.00	0.132
W Volleyball	26.80	28.22	0.000
W Track	21.41	23.30	0.026
M Baseball	53.39	61.26	0.000
M Basketball	37.51	39.88	0.000
M Crew	10.51	14.48	0.311
M Football	34.29	39.52	0.000
M Golf	34.29	30.92	0.000
M Soccer	28.55	30.32	0.000
M Wrestling	25.27	25.35	0.000

Table 5. Ratios of Credits Earned Online By Team. The average number of credits taken online, averaged over five years, for student athletes is shown, along with the ratio of credits conferred online during in season terms. The ratios of credits taken online by student athletes and the general student population at Oregon State was analyzed by the two-point T-test.

With the exception of Women's Cross Country and Men's Golf, the average credits taken in season by each team was higher, showing a preference towards this type of class during competitive seasons. Additionally, Men's Crew and Women's Cross Country were the only teams with statistically insignificant variations from the average number of credits earned online, showing that the prevalence of taking online classes between the majority of teams and their college peers was markedly different.

Due to their higher likelihood of choosing online classes, student athlete GPA was compared with full-time online students in Table 6. Full-time online students often represent a more non-traditional student pool and are more likely to be working full-time in addition to their online college coursework (Colorado and Ebrle, 2010). These non-traditional student schedules may exhibit some similarities of the scheduling demands often experienced by student athletes.

GPA Difference Between Online Students and Student Athlete Population

Panel A: Combined Student Athlete Populations			
Group	Average	Difference from Online Population	P-Value
Total Combined	3.08	0.08	0.0003
Male Athletes	2.87	-0.07	0.0036
Female Athletes	3.23	0.20	0.0000
Panel B: Teams that take Highest Percentage of Online Credits			
Team	Average	Difference from Online Population	P-Value
M Baseball	2.88	-0.06	0.1617
M Football	2.66	-0.28	0.0000
W Softball	2.87	-0.16	0.0007
W Basketball	2.89	-0.14	0.0885
W Golf	3.19	0.17	0.0024

Table 6. Differences in GPA Between Student Athletes and Full-Time Online Students. The average GPA of student athletes compared to pools of full time-online students using GPA differences and the two-sampleT-test.

This analysis showed that, as a whole, student athletes were statistically different from the online student population. The total combined pool outperformed the general online population by 0.08 GPA points. Female athletes outperformed more significantly, at 0.20 GPA points about female online peers. Male athletes underperformed their male online peers by -0.07 GPA points. All three of these groups, shown in Panel A of Table 6, had near negligible P-values. Panel B of Table 6 looks at specific teams that take the highest percentages of credits online. All of these teams have significant P-values, except Baseball, with a P-Value of 0.16 when compared to full-time online male students. Baseball also takes the highest percentage of credits online, which may indicate that their coursework is the most similar to full-time online students.

Courses offered through Oregon State eCampus are limited and to work that can be accomplished outside of the classroom. Students taking primarily online courses may thus be limited in their choice of major. The majority of majors offered though Oregon State eCampus are within the College of Liberal Arts. This could be a factor in driving many athletes choices to study a liberal arts program due to the higher likelihood of flexibility in their coursework.

Coaching Changes and Team Culture

As discussed in Harrison, et al. (2010), team culture can have a significant impact in how academics is valued within a team and across an athletic department, regardless of incoming academic preparation. Within the Oregon State athletic department, a notable difference in the data occurred when Oregon State hired a

new head football coach in December 2015. Specifically within the football team, Gary Andersen placed a large focus during the program's transition on player academics and activities beyond the field. His coaching staff instituted a "Beyond Football" reward program, somewhat similar to the "Scholar-Baller" reward system described previously (Harrison, 2010).

While Football overall improved over the 5 year data set of this study, shown by a moderately strong linear tend (R^2=0.807). However, team GPA prior to Andersen's era compared against the terms following his hiring produces a negligible p-value of 9.35E-05 when compared using the two-sample T-test. This change was further investigated using a structural break model by way of ANOVA analysis. ANOVA read outs are included in Supplemental 2. For three different models: a shift in trend model (Figure 1), an intercept model with a general trend (Figure 2), and a shift in the model (Figure 3), all fit to a significant F-statistic. These models are able to reject the null, representative of a clear separation between the academic performances of the football team under different leadership.

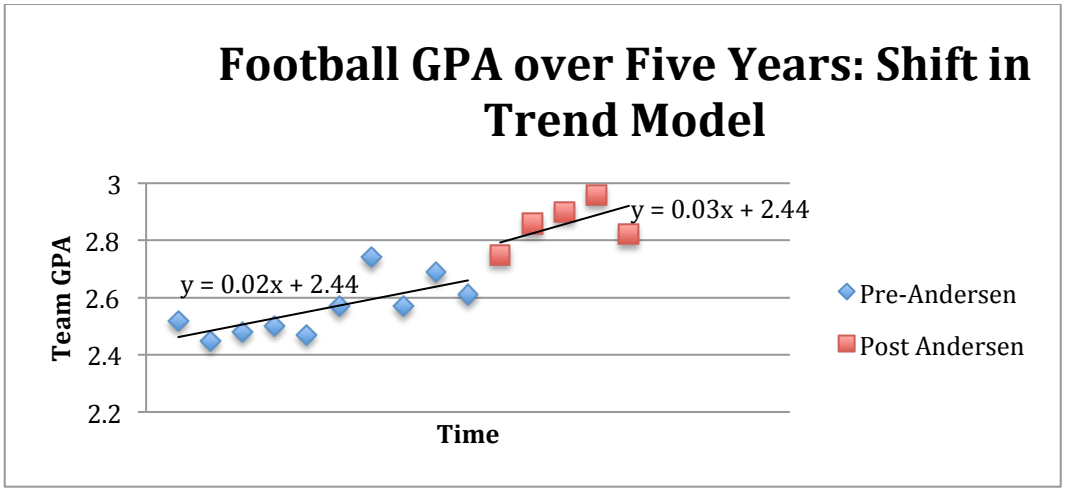


Figure 1. Football GPA Growth Using Shift in Trend Model. Following Andersen's hiring, this model shows a change in slope for the improvement of Football GPA.

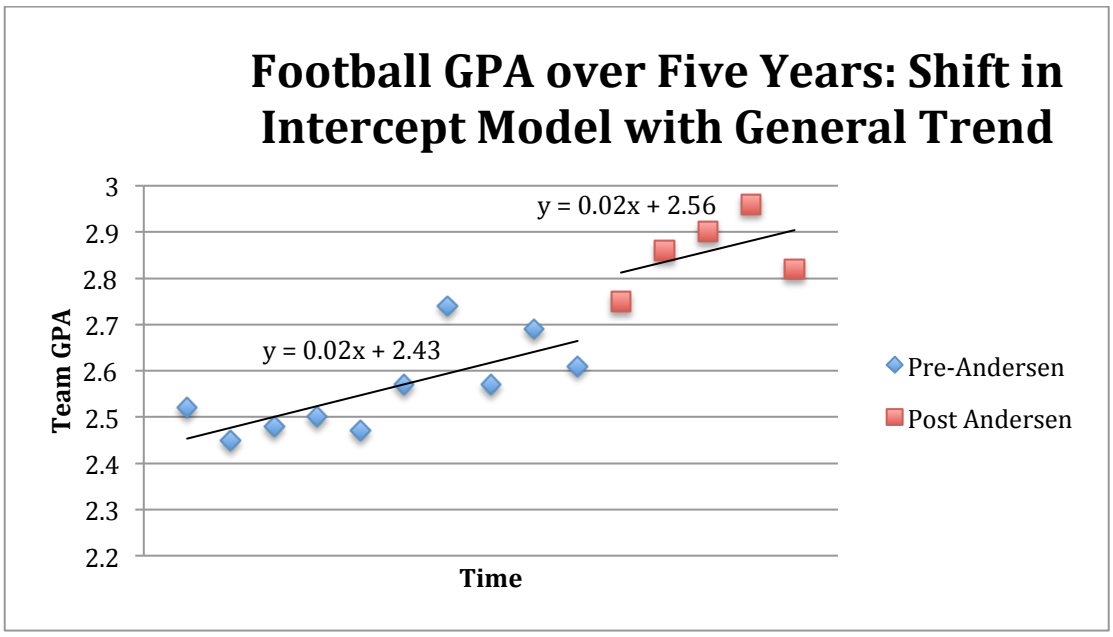


Figure 2. Football GPA Growth Using a Shift in Intercept Model. This graph uses the same slope, but shows a shift in intercept produced by a break in the line improving the football GPA following Andersen's hiring.

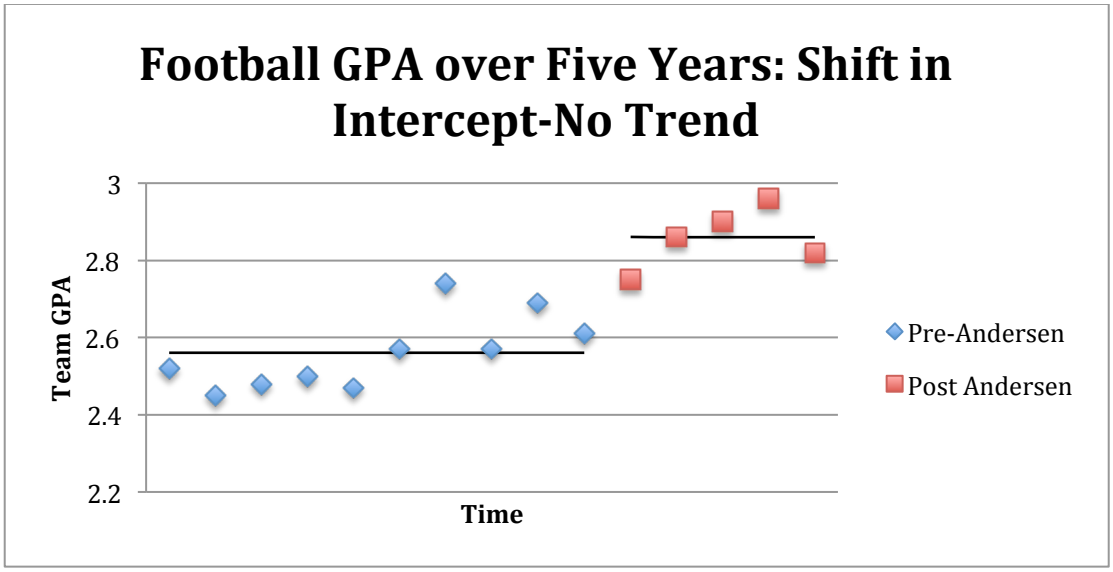


Figure 3. Football GPA Growth Using a Shift in Intercept Model with No Trend. This model depicts no linear growth of football GPA, but a rise in the general level of GPA, therefore intercept, following Andersen's hiring.

This achievement is an example of how policy and priorities of a coaching staff and team culture can influence positive change in areas beyond athletic

performance. The positive linear trend could also be indicative of a shift over time in the individuals on the team and as new recruits began to replace graduates, the overall environment and the value placed on academics within their locker room shifted. Thus, freshmen that came to Oregon State in Fall 2011 may seen a difference in how the team regarded academic endeavors by their graduation.

Differences in Preparedness of Student Athletes

Eitzen, et al. (1986) described how the biggest factor in student athlete academic performance may not be that different from non-athlete peers, but simply a measure of college preparedness. Readiness for collegiate coursework is related to social factors, high school location, and course selection and availability (Combs, 2010). College admissions committees often gauge college preparedness using metrics of high school GPA and standardized college entrance exam scores, most commonly the SAT and ACT.

To test this potential descriptor on the Oregon State student athlete population, freshmen student athlete admissions data were combined with the average for the Oregon State incoming freshmen enrollment average. This analysis compares the average high school GPA of incoming student athletes to that of the average incoming freshmen at Oregon State and tests the feasibility of SAT scores as a predictor of college academic success within the student athlete population.

The Oregon State Admissions Office only considers unweighted GPA in admissions decisions; therefore all values that contribute to OSU's incoming average are on a standard 4.0 scale. Some high schools produce a weighted value for

Advanced Placement of International Baccalaureate courses, causing this value to be out of more than a 4.0. It is important to note that data obtained for student athletes from the athletic department could contain values from recruiting questionnaires, which accept a weighted GPA. It is not possible to tell if that was the case from the anonymously encoded data. For this reason, all GPA values were compared as if out of 4.0.

Table 7 presents the average difference of student athletes by team compared to the general incoming population at Oregon State. It also includes their average difference from the general undergraduate once in college, which includes the same values from Table 1. For each team, the variation between the GPA gap in high school and during college is shown. The difference column shows the difference in the high school level minus the difference in college, showing change from high school to college. Finally, the variation in incoming student athletes against the average incoming student was analyzed using the two-sample T-test.

Women's Cross Country was the only sport to have a higher average incoming high school GPA than the average Oregon State student. Therefore, the overall average of freshmen athletes had a lower high school GPA than their non-athlete peers. This supports the earlier point that athletes in high school may be motivated by different priorities than the other college-bound peers (Hildenbrand, 2009).

Male sports have a larger value for this difference, suggesting a larger gap between male athlete academic investment at the high school level than that of the female athlete. The pattern of male athletes having a lower level of performance

Differences in High School and College Performance

Panel A: Combined Student Athlete Population				
Sport	Average Difference from Incoming Freshmen	Average Difference from General Undergrad	Difference	P-Value
Total Combined	-0.148	-0.010	0.14	0.738
Male Athletes	-0.230	-0.155	0.07	0.679
Female Athletes	-0.084	0.066	0.15	0.497
Panel B: Female Student Athlete Populations				
Sport	Average Difference from Incoming Freshmen	Average Difference from General Undergrad	Difference	P-Value
*W Cross Country	0.118	0.365	0.25	0.002
W Golf	-0.087	0.033	0.12	0.571
W Soccer	-0.136	0.150	0.29	0.015
W Volleyball	-0.084	0.157	0.24	0.360
W Basketball	-0.155	-0.269	-0.11	0.110
W Gymnastics	-0.080	0.162	0.24	0.470
W Softball	-0.280	-0.289	-0.01	0.001
W Swimming	-0.039	0.005	0.04	0.932
W Crew	-0.011	0.088	0.10	0.595
Panel C: Male Student Athlete Populations				
Sport	Average Difference from Incoming Freshmen	Average Difference from General Undergrad	Difference	P-Value
M Football	-0.381	-0.366	0.01	0.000
M Soccer	-0.086	0.010	0.10	0.193
M Basketball	-0.329	-0.385	-0.06	0.003
M Wrestling	-0.322	-0.249	0.07	0.000
M Baseball	-0.197	-0.141	0.06	0.000
M Crew	-0.056	-0.089	-0.03	0.081
M Golf	-0.237	0.136	0.37	0.088

Table 7. High School versus College Performance in Student Athletes. The average difference between incoming athletes and the average incoming freshmen is shown in the first column, along with the average difference of performance in college in the second. The third column shows the difference between those two values, indicating how performance from high school to college has change. The two-sample T-test against the average incoming GPA was also used. Women's Track was omitted from this analysis due to the inability to separate incoming Cross Country and Track athletes.

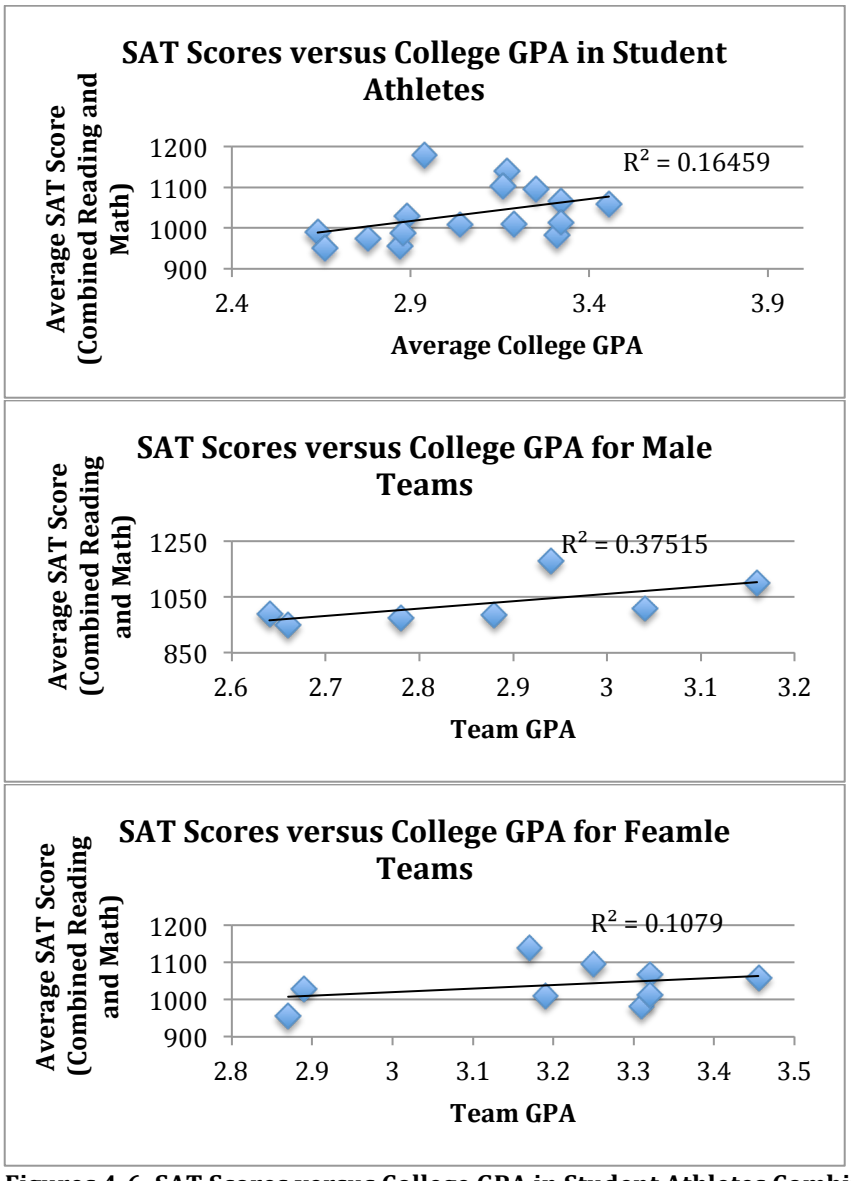
aligns with the differences shown in their college careers, such as shown in Table 1. With the exception of Men's Basketball, Women's Basketball, Women's Softball, and Men's Crew, most sports perform better relative to their peers in college athletics

than their athletes performed in high school, meaning that the gap between their non-athlete peers in college is smaller than it was in high school. This is shown by positive values in the difference column of Table 5. This is promising because while student athletes may have come in to college with a somewhat lower overall performance than the average undergraduate, they are able to make up some of that dissimilarity throughout their college career. This could stem from a variety of reasons, such as increased involvement and interest in their major fields than general high school course work or via student athlete academic support programs providing structured study time or tutoring.

When using the T-Test comparing the individual athlete data points for difference from incoming freshmen, all male sports other than Soccer showed statistically significant difference between general male undergrads in the same entrance year and the male student athletes. Three female sports were also below a P-value the 10% level: Cross Country at 0.0016, Soccer at 0.0152, and Softball at 0.0009. The remaining female sports have large P-values, indicating insignificant variation from other entering college students.

When tested as combined populations, female athletes, male athletes, and all athletes had a positive improvement for the gap between high school and college GPAs but also demonstrated above 0.10 P-values. Therefore, any significant differences found at the team level for high school level variation from the average Oregon State student were team specific. As an aggregate pool, student athletes were not significantly different at the admissions assessment of college preparedness than their non-athlete counterparts.

The Scholastic Aptitude Test (SAT) typical measures for college preparedness and potential performance once at university. Average team SAT scores in reading and math were thus used to compare against college GPA. A table of SAT averages and percentile ranges for the reading and math sections can be found in Supplemental 3.



Figures 4-6. SAT Scores versus College GPA in Student Athletes Combined and by Gender. This plot relates the average incoming combined reading and math SAT score for each team over the five-year time period with the college performance (GPA) of the same team.

For the combined pool, the average team SAT score and college GPA were plotted in Graph 2. The regression R^2 value for this relationship is 0.165, showing a weak correlation. When plotted as just male sports, the regression is 0.375 (Figure 5). For female sports, the value is 0.108 (Figure 6). Therefore, while the SAT shows a baseline of preparedness for college coursework, it does not show to be a significant predictor of academic success across athletic teams.

Conclusions

Differences in academic performance are present within the Oregon State student athlete population from the general undergraduate populous. Overall, the most significant disparities arose at the gender level. Female athletes showed a higher level of academic performance than their undergraduate peers, while male athletes showed a pattern of lower performance, particularly in revenue earning sports such as Football and Men's Basketball. This could be significantly influenced by team culture and an overall societal acceptance of male athletes being high performers in sport but not being held to as high standards in the classroom. Male athletes also often have higher potential for higher earning careers in their sport than females, creating a sociocultural difference in the motivation of being a student athlete for some males versus females.

Other variations arise at the college-by-college level but a significant pattern cannot be obtained without access to anonymous data from other colleges, such as Science or Engineering to see how student athletes perform in different kinds of coursework or in classes with larger time demands per credit, such as laboratory

courses. Athletes are clustered into certain colleges such as Public Health or Liberal Arts as has been shown at other universities (Upton and Novak, 2008), but that could be appreciably skewed by the alignment of interests in those fields due to their relationships to sport.

Disparity between in and out of season terms for athletes proved relatively insignificant, showing that athletes likely have methods or utilize support services to cope with the time demands of athletic competition on their course schedules. A gap in college preparedness, shown by lower high school GPAs of athletes than the average incoming undergraduate are somewhat made up at the college level, which could indicate a positive impact of athletics on academic growth. This also supports data that athletes often have higher retention and graduation rates than non-athletes as shown in various studies, such as Hildenbrand (2009).

These analyses in this paper were designed based on available data from Oregon State University. Ideally, similar metrics could be applied to data obtained from other universities in future research. Then, comparison of student athlete academic performance could be made across various athletic conferences, geographic regions, and sizes of institutions. Data in more varying fields of study would also enrich the body of research. Comparisons between classes of NCAA universities, Division I, II, and III, could show how athletic scholarship availability may contribute to these factors as well.

Athletics is credited with character development and invaluable life experiences for many student athletes. The current press climate has influenced some to hold a more negative opinion of college athletics, but many student athletes

are very motivated, high achieving individuals on and off their respective playing arenas.

College athletics is an arena that I feel very fortunate to have been able to call myself a part of and has contributed immensely to my own overall development through my time at Oregon State. I am constantly inspired by my fellow student athletes' endeavors and aspirations. Athletics contributes to a university immensely, more than any tangible amount that is brought in via revenue, but through unquantifiable means of helping to establish a culture and unite current students and alumni. I certainly will be rooting for the Beavers for the rest of my life!

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Supplemental 1. GPA Point Scale

Term and total GPAs are calculated using the following scale per credit:

Letter Grade	GPA
A	4.0
A-	3.7
B+	3.3
B	3.0
B-	2.7
C+	2.3
C	2.0
C-	1.7
D+	1.3
D	1.0
D-	0.7
F	0.0

Supplemental 2. Analysis of Variance (ANOVA) for Football GPA

2A. Summary Output Using Shift in Trend Model

Regression Statistics	
Multiple R	0.921391466
R Square	0.848962234
Adjusted R Square	0.823789273
Standard Error	0.071405177
Observations	15

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	0.343908941	0.171954471	33.72516394	1.18717E-05
Residual	12	0.061184392	0.005098699		
Total	14	0.405093333			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	2.437624288	0.048126742	50.6500994	2.3022E-15	2.332765125	2.542483452
X Variable 1	0.022365361	0.007778973	2.875104604	0.013956893	0.005416435	0.039314288
X Variable 2	0.009873728	0.005436228	1.816282759	0.09437514	0.001970796	0.021718252

2B. Summary Output Using Shift in Intercept Model with General Trend

Regression Statistics	
Multiple R	0.922318664
R Square	0.850671717
Adjusted R Square	0.82578367
Standard Error	0.070999937
Observations	15

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	0.344601441	0.172300721	34.1799303	1.1088E-05
Residual	12	0.060491892	0.005040991		
Total	14	0.405093333			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	2.433945946	0.046396545	52.4596377	1.51345E-15	2.332856558	2.535035334
X Variable 1	0.022918919	0.007382222	3.104609871	0.009111627	0.006834439	0.039003399
X Variable 2	0.126108108	0.067659181	1.863872811	0.086981126	-0.021308584	0.2735248

2C. Summary Output Using Shift in Intercept Model with No Trend

Regression Statistics	
Multiple R	0.85482672
R Square	0.730728721
Adjusted R Square	0.710015546
Standard Error	0.091601142
Observations	15

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.296013333	0.296013333	35.27845007	4.90714E-05
Residual	13	0.10908	0.008390769		
Total	14	0.405093333			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	2.56	0.028966825	88.37696371	1.86409E-19	2.49742098	2.62257902
X Variable 1	0.298	0.050172012	5.939566488	4.90714E-05	0.189609958	0.406390042

Supplemental 3. SAT Performance Averages and Percentile Ranges By Team

		SAT Score Ranges				
Sport	College GPA	Average SAT	Percent >90%	Percent 80-89%	Percent 70-79%	Percent 60-69%
W Basketball	2.89	1029	0%	0%	13.33%	60%
W Golf	3.19	1010	0%	0%	14.29%	42.86%
W Gymnastics	3.32	1067	0%	8%	30.77%	30.77%
W Rowing	3.25	1095	0%	12.60%	31.03%	40.23%
W Softball	2.87	955	0%	0.00%	18.18%	27.27%
W Soccer	3.31	982	0%	0.00%	15.15%	39.39%
W Swimming	3.17	1140	0%	11.11%	51.85%	25.92%
W Cross Country/Track	3.455	1059	2.56%	2.56%	30.77%	33.33%
W Volleyball	3.32	1013	0%	0%	13.33%	60%
M Baseball	2.88	987	0%	4.44%	22.22%	28.89%
M Basketball	2.64	989	0%	0%	20.00%	20.00%
M Crew	2.94	1180	1.98%	22.77%	42.57%	24.75%
M Football	2.66	950	0%	1.01%	8.08%	30.30%
M Golf	3.16	1102	0%	9%	36%	36%
M Soccer	3.04	1009	0%	0%	16.67%	46.67%
M Wrestling	2.78	974	0%	3.85%	15.38%	23.08%

Supplemental 2. This table shows the average GPA by team in college compared to the average SAT score. The percentile sections show what percentage of incoming freshmen over the fiver year period (2011-2016) fell within each percentile range of the SAT.