Mathletics: How the Science of Numbers is Changing Sports

A research report on talent development in sports analytics

By Collin Dougherty

UNL EDPS 189H, 11/21/18

Abstract

I chose to study the talent development of successful sports analysts. In order to accomplish this, I interviewed Tucker Zeleny, head of the Nebraska sports analytics department, and made comparisons to the talent development process of Billy Beane, former general manager of the Oakland A's. I found that many common talent development themes surfaced in their lives, including early experience, important mentors and peers, a passion and singleness of purpose, being in the right place at the right time, making the necessary sacrifices, a good upbringing, the right mindset, and an innovative nature.

Introduction

Tim Miles sits down in Tucker Zeleny's office on the east side of Memorial Stadium, days after being eliminated from the Big Ten Tournament by 13 seed Penn State. With the loss, his Huskers finished the season 12-19, a second consecutive disappointing season after the surprise NCAA tournament run 2 years before. Fans are becoming increasingly doubtful. "Tim Miles' teams can't shoot", and "he can't coach defense now that Craig Smith left." Behind the scenes, Tim Miles has as many questions as the fans do, and that's what brings him to Zeleny's office on this March day. Zeleny is the new guy on the block, recently hired as the director of the brand new Sports Analytics department. Miles left that meeting with a clear understanding of his team's issues, but also a clear understanding of what needed to change. Zeleny had crunched the numbers, and Nebraska's atrocious collapse mostly boiled down to one thing: 3 pointers. Nebraska couldn't shoot the 3, and even worse, it couldn't stop teams from shooting it on them. Miles' team was 347th in the country in 3-point defense that season. Miles left with cold hard data. Only time will tell, but in that moment, his career path and legacy may have been altered forever. The following season, his team went 22-10, sporting the best 3-point defense in the Big

Ten and the 28th best in the nation. This year, the 7-1 Huskers have broken into the top 25 and sit on the verge of a history making season, thanks to their 3-point defense, 8th in the country.

The story of the Nebraska basketball team is just one example. When should football coaches go for it on 4th down? Is there such a thing as the hot hand in basketball, or is it just random variation? Why do home teams have a competitive advantage? These are the questions sports analytics seeks to answer. As an aspiring sports analyst, I decided to dig deeper into the field, and ask: how is it that people become talented in the field of sports analytics? What factors contribute to their success or lack thereof? And how would a young person aspiring to enter the field do so? Based on a conversation with a revolutionary sports analyst at the University of Nebraska-Lincoln and study of the book Moneyball by Michael Lewis on the life of Billy Beane, the research presented in this paper seeks to answer these questions and more. There were a multitude of common themes between the two individuals, as well as some differences, and several new findings. As a whole, the findings support existing knowledge in talent development research and come to several unique conclusions.

People

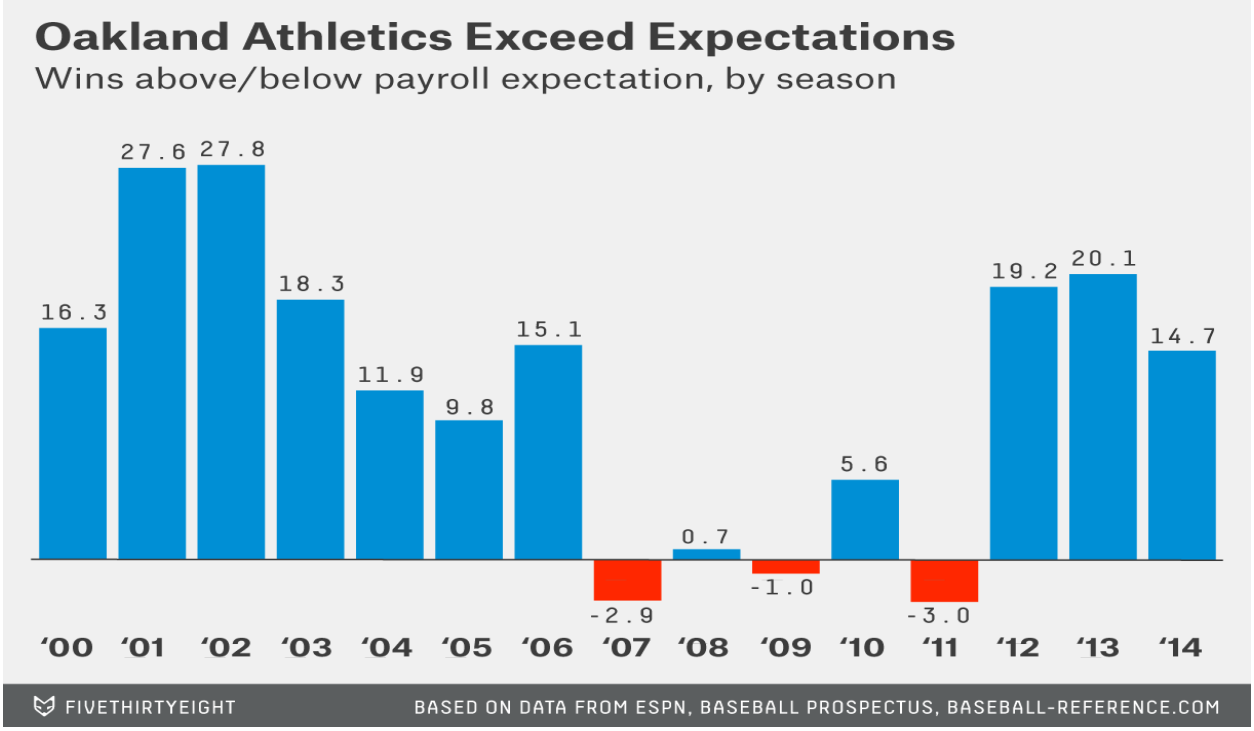
The primary contribution to this study comes from Tucker Zeleny (left picture), the director and head of the Sports Analytics Department at the University of Nebraska-Lincoln. Zeleny works in collaboration with the various coaching staffs and teams, seeking any competitive advantage available through data analytics. Zeleny attended 9 years of postsecondary school, obtaining a bachelors of science in mathematics and a masters and PhD in Statistics. Upon graduation in 2015, he was hired to lead the first sports analytics program in college athletics, and he remains the director of the only sports analytics program in collegiate athletics. Zeleny's talent is clearly displayed through his unique position, his education, his position on the editorial board of the Journal of Sports Analytics, and his recognized importance by various coaches and administrators. As the founder of the first sports analytics program in the history of college sports, his talent is clear. Further, his expertise is clearly demonstrated through his extensive education, culminating with a PhD, placing him among some of the most educated people in the world. More proof of his expertise can be found in coaches' and administrators praise for Zeleny.

> *"It's over my head," Erstad said jokingly. "I'm like, 'Break it down for me a little easier.' But he's got his whole spreadsheet with outcomes in every situation and the expected run return. We've taken a hard look at that."- Darin Erstad, baseball coach*[1]

> *"He's my Billy Beane." – Steve Waterfield, Nebraska senior associate athletic director for performance and strategic research*[2]

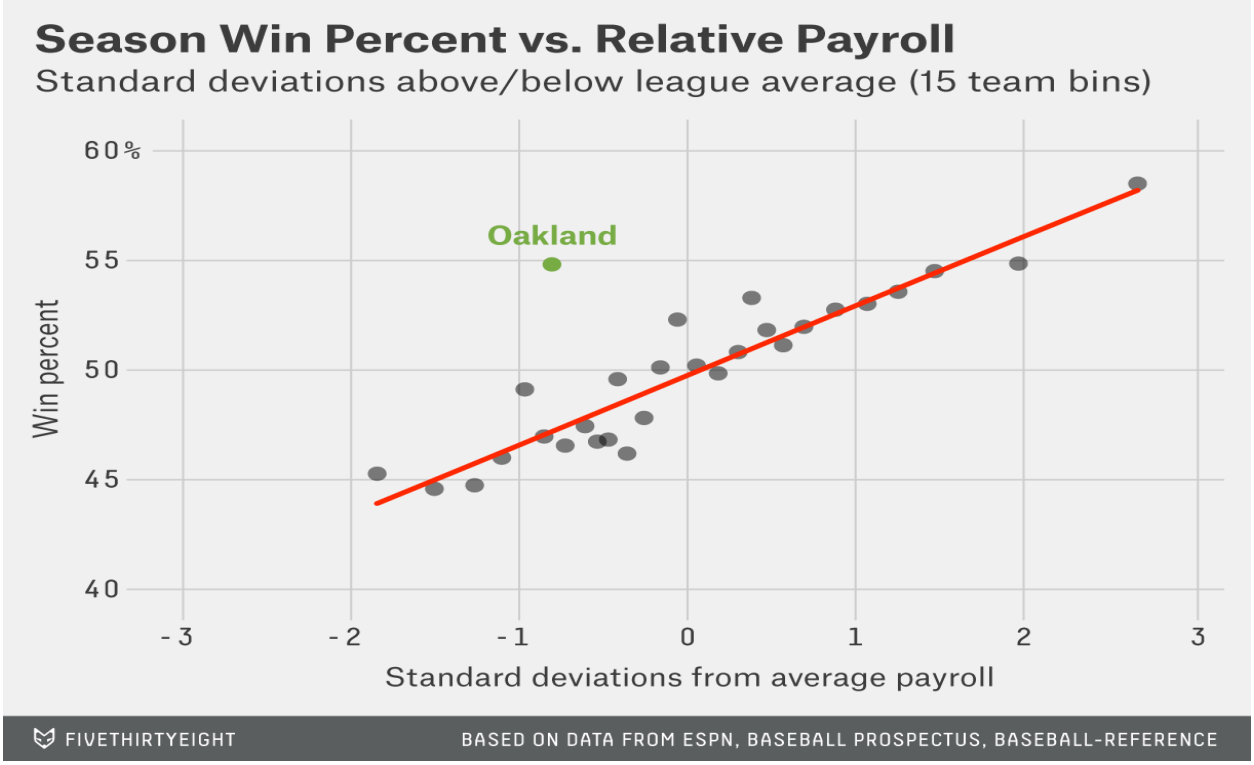
[1] https://www.omaha.com/huskers/tucker-zeleny-s-job-grows-in-importance-with-coaches-eager/article_50c82446-a0f0-5f4e-8ddc-6a55b085ccf8.html
[2] https://www.cbssports.com/college-football/news/can-nebraska-reverse-fortunes-by-hiring-an-advanced-stats-whiz/

Many connections are explored between Zeleny's talent development and that of Billy Beane (right picture), former General Manager of the Oakland Athletics and a primary kickstarter of the analytics revolution in baseball. Since Beane took over at Oakland and implemented data analytics in baseball, the usage of data analysis in sports has taken flight. Beane led the A's to great success using cutting edge and unorthodox methodology, relying on what the numbers predicted as opposed to the opinions of old-timers and baseball scouts. His reliance on data analytics gave him a competitive advantage he exploited for years. The following graphs and discussion illustrate just how profound was his impact on the Oakland A's, and the importance of sports analytics.

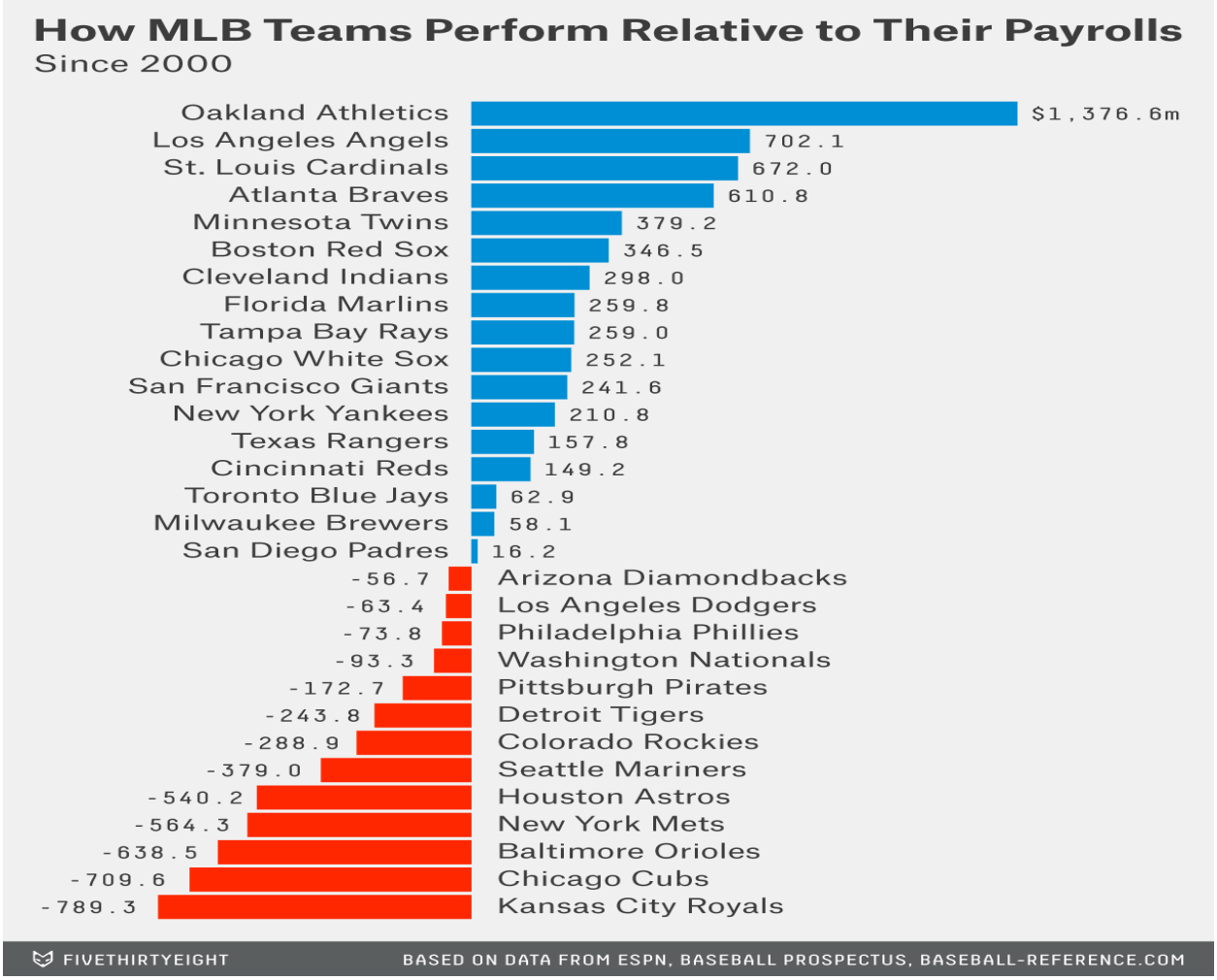


This graph shows the wins above or below what would be expected based on the size of Oakland's budget from 2000-2014, where 0 would be exactly average performance. The graph starts in 2000 because that is when Billy Beane first employed "Moneyball" tactics, using data

analytics in sports for the first time. As can be seen from the graph, the A's outperformed expectations by almost 20 wins per season over the first 7 seasons of using sports analytics. Over these first 7 seasons, sports analytics was the difference between making the playoffs and watching from home. Interestingly, from 2007-2011, it seems as though the league caught on to what Oakland was doing, reducing their competitive advantage. But by 2012, Oakland adapted back, and regained their competitive edge. This year the A's went on another record setting season, finishing 97-65, before falling to the Yankees in the wild card game.



This next graph further displays the striking affect sports analytics had on the A's record over this span, and that luck has nothing to do with their success. If the A's had simply been lucky, we would expect to see several other teams far from the predictive line of win percentage based on payroll. Instead we find only one outlier: Billy Beane's A's.



Finally, we see a graph displaying the monetary output of each MLB team relative to their payrolls from 2000-2014. The dollar figures were calculated by estimating how much money a team must spend to gain an extra win. As can be seen from the graph, Oakland's output was over 1.3 billion dollars more than their actual spending. What we learn from these graphs is that sports analytics is not a matter of a few wins and pennies in savings. Billy Beane's work shows us that, when used properly, sports analytics is the difference between a successful season and an unsuccessful one. Sports analytics is not pennies on the dollar, but billions of dollars in savings.

Methods

I began with a list of 10 individuals who are considered highly successful in sports analytics, based on reading, research, and the opinions of popular sports analytics sites and journals. I managed to contact eight of them. Zeleny was among the original 10 and was available for interview due in part to an existing relationship with me. I plan to intern in the sports analytics department soon and have remained in contact with Zeleny through the process. He was also chosen in large part due to his proximity. Further, despite reaching out to seven other highly successful people in sports analytics, I was unable to secure interviews with any of them aside from Zeleny. Beane was also among the list of 8 I contacted, and although he was not available for interview, many resources have been dedicated to covering his story by other individuals, most notably through the popular book and film *Moneyball*. Using those and other available resources, including a report I completed on Beane's life from prior work, several main points were used for comparison. Zeleny was interviewed over the phone for his convenience, and the interview was then recorded using my personal laptop. The following questions were used to assess his talent development.

- What do you do for the university and sports analytics program and what does your day to day look like?
- What would you say the essential skills are that are important in helping you do your job in sports analytics?
- How do you think that you have learned and developed those skills over the years?
- What would you say drew you to the analytics side of sports and how were you introduced to it?

- It sounds like both your advisor and the professor who taught the sports analytics course were pretty important to your path?
- What would you say some of the other most important things have been to bring you to your career in sports analytics?
- You've talked about your advisor and professor; would you say there have been any other mentors or peers who have been really important to you?
- Would you say that there are challenges in communicating what you find and getting the different sports to buy in?
- Would you say that your parents or your family encouraged your pursuit of work in physics at first and then math and eventually sports analytics?
- Would you say that they taught you good work ethic and perseverance too?
- What kind of sacrifices would you say that you've made over the years?
- Did you play sports growing up, and did that influence you at all, or if you were more of a fan? What was your interaction like in that way?
- What kind of importance would you give the skill of being creative, thinking outside the box in sports analytics?
- Is there anything that you would want to add that you feel is important?

Once the interview was complete, I transcribed the interview for further analysis. I then combed through his answers, looking for important themes to Zeleny's talent development. The themes discovered are discussed in detail below, and then used to draw comparisons to Billy Beane's talent development.

Results

Early Exposure

It is clear that early exposure to his talent domain was a crucial factor to the talent development of Tucker Zeleny. He grew up playing all the sports he could get involved in. While many kids his age spent their time playing video games or watching tv, Tucker was outside.

"I played all the sports as a kid, wasn't necessarily into video games or anything like that, I'd like to get outside and play football with some friends or go to the court and play pickup basketball with some guys, or baseball, whatever. I was just always outside playing something."

His time constantly playing sports gave him an understanding of sports unique to those who have played it. It's hard, if not impossible, to find the answers to winning in sports without first knowing what the right questions to ask are. His time in sports gave him a deeper understanding of each sport that has allowed him to ask the right questions in his work now. Further, he grew up a big sports fan, particularly of Nebraska. As a Carleton, Nebraska native, he grew up watching the Huskers play every chance he got. His early exposure to sports, whether it be as a player or a fan, was undoubtedly pivotal to his eventual interest in sports analytics.

Zeleny was also exposed at a young age to math, as most American children are. As he progressed in math, he found that it's logical, right or wrong nature drew him in. Further, he found himself naturally capable in it. As his skill in math developed, he simultaneously was growing more and more involved in sports. So, it was only natural that he started seeing statistical trends in sports. His exposure to math and sports were certainly essential to his eventual choice of sports analytics as his talent domain. But almost every boy in the world is

exposed to these two things from a young age, so what was different about Zeleny? As we will see next, his unique passion for not just one, but both math and sports, was the essential differentiating ingredient between Zeleny and every other boy in the world.

Passion/Singleness of Purpose

While his early exposure to both sports and math was essential, it was the love of both that led Tucker down a path different than almost everyone else. There are two passions in particular which have combined to bring him such success in the field.

The first passion which has led to his success in and pursuit of success in sports analytics is his love for math. He relies on mathematical and statistical techniques every day.

"I grew up as a kid and always liked math, it just came naturally to me. The logical, right or wrong nature of it drew me in."

He describes math in a way most mathematicians do. His love for the beauty and clarity of mathematics is apparent, and it motivated him to study mathematics for his undergraduate degree. As he, I, and every other math major can attest, you don't finish a degree in math unless you have an underlying passion for it. Without this passion, the seemingly endless piles of homework and numbers will drive you mad. His love of mathematics is the first, and most unique, of his passions which have driven him to sports analytics.

His second passion is for sports, particularly Nebraska sports.

"You know, I grew up a big sports fan, being from Nebraska, a big Nebraska fan in particular."

His love of sports led him to ask questions about sports using statistics while in graduate school. Where most statisticians see only numbers, Zeleny saw a way to study a topic he loved in a field he loved. Two seemingly unique talent domains, sports and data analytics, found themselves colliding in the mind of Zeleny. What happened in his brain didn't just stay there, it made the million-mile journey from his brain to his heart.

"Sports analytics combined a couple of the things I was really passionate about."

Not only is Zeleny a big sports fan, but he is a passionate Nebraska fan, the team he now gets to go to work for every day. This passion for sports analytics combines with his diehard Husker nature to produce a man who is uniquely passionate for his talent domain. I envision him as the type of competitor Scott Frost describes.

"…he's always ready to compete. I talk to the guys about being the type of guy where you have cleats and a ball and hoop shoes and golf clubs in the back of your car in case any kind of game breaks out" -Scott Frost, head football coach, Nebraska

But Zeleny's competitive nature and passion for sports alone weren't enough to make him successful in the field. He needed others who would guide him, help him, and make him into who he is today.

Mentors and Peers

There have been numerous people who have been crucial to the success of Tucker Zeleny in sports analytics. The first example of this is his academic advisor during his time at UNL. His

academic advisor helped him to realize that his initial major, physics, wasn't as good of a fit for him as a math degree would be. Once switching to a math major, his advisor helped him discover his passion for data analytics and its more applied nature. His advisor also had a profound impact on his ability to enter the field of sports analytics. The final year of Zeleny's PhD, several administrators from the Nebraska athletic department approached Zeleny's advisor. They were intrigued with the idea of using data analytics in the same way that it had been used in professional sports with massive success. They came with one question: who could lead this revolutionary program? Tucker's relationship with his advisor paid off; his advisor pointed the athletic department straight to him. Zeleny certainly would not be where he is today if it weren't for the guidance of his academic advisor.

Another important mentor in Zeleny's life was a faculty member in the statistics department who taught several of Zeleny's courses during his time as a student at the university. The faculty member was particularly interested in sports analytics, and one semester decided to teach a graduate course on it. Zeleny signed up. This was one of the most pivotal moments in Zeleny's career path, truly fanning into flame his passion for sports analytics. His interest in sports analytics grew immensely during that semester, and he began to consider work in sports analytics as a truly possible career path. He was also able to work with the professor on sports analytics research, working particularly on weight lifting data and possible injury indicators that might turn up. Through both his work in research with this important faculty member, and the pivotal sports analytics course he took which set him on his career path in sports analytics, the influence was profound and essential to Zeleny's talent development.

"[My advisor and the faculty member] definitely pointed me in the right direction and were the right connections to have, especially my advisor here. I absolutely followed them along to get where I am."

His advisor and the faculty member in the statistics department were extremely important mentors. Zeleny has also had several peers who have been important to his success in the world of sports analytics. Connections with sports analysts in MLB, the NFL, and NBA front offices, among others, have proven to be crucial. The ability to talk to other experts in the field and learn from what others are doing is of crucial importance because it allows him to build off a stronger foundation of work, as opposed to wasting time "discovering" trends that others have already found. It is particularly interesting that his connections are almost solely at the professional sports level, because they are freer to share information, as they will never play against each other on the field or court. It is impossible to know everything about a specific domain, so having connections to other talented peers is crucial.

"…if you don't know how to do it, someone else probably does…"

In addition to peers in the field of sports analytics, people he has worked with in his day to day have been important to his effectiveness as the Director of Sports Analytics. In particular, Zeleny mentioned assistant coaches and team staff members as being important to getting his voice heard. Especially in the beginning stages of working with each team, Zeleny often faces a negative stereotype.

"There's a negative connotation with sports analytics sometimes. People treat it as, hey, these nerds with their computers are going to come in and tell us what we are doing wrong"

But, the presence of team members has often made the transition phase smoother and helped create buy in from the team Zeleny is beginning work with.

"Often times you are throwing a lot in the lap of an assistant coach or director of operations, and they're not really sure what you're there for… there have been times where that has been made smoother on account of certain team members."

In addition to the mentors and peers who have played a big role in Zeleny's life, his parents were also crucial. Zeleny grew up on a farm, saying that his parents used the farm life to teach him the importance of hard work. He also talked extensively about his parents' role in encouraging him to persevere through his graduate studies.

"[They] certainly had a big role in my life. I grew up from a farming background, more of the hard work kind of model growing up. It's not like my parents were breaking down the average yardage per play of the Green Bay Packers or anything, or very many people at all were for that matter. But they definitely encouraged me the whole way and supported me. I would say they were really helpful in encouraging me to persevere through graduate school especially. When a lot of people my age were getting married, getting "real jobs", starting families, I was still pursuing higher education and that was discouraging. But I think they knew it was something I

was capable of doing, and so they encouraged me to take it as far as I possibly could. But it definitely helps to have a strong foundation to fall back on."

His parents, various team members, assistant coaches, the professor in the statistics department, and his academic advisor were certainly crucial to his talent development and success in sports analytics.

Mindset

Mindset is a crucial factor in the talent development process, and that is displayed in Zeleny's story as well. In my interview with him, Zeleny talked extensively about the importance of being a self-motivated person, and of having a growth mindset.

"Yeah, certainly I think my parents played a big role in that. Kind of teaching me about having a self-confidence and knowing that you've got to be out there and do this for yourself, no one else is going to do this for you. When you get knocked down you got to get back up and when you kind of put your mind to it and work hard, you're capable of anything. You are kind of your own limiting factor as far as what's achieved. So it's kind of that mindset of hey, I've certainly relied on the help of others and others have been important in getting to me to where I've gotten, but at the end of the day I've got to trust myself and not be putting the blame necessarily on anyone else but knowing I've got to accomplish what I want to accomplish."

Zeleny understands the importance of having the right mindset, particularly the importance of being a self-starter. His quote demonstrates his intense motivation for success, not just in sports analytics, but all facets of life. In order to reach the level of talent and success which Zeleny has,

failure is inevitable. So, his mindset, “when you get knocked down, you gotta get back up, and when you put your mind to it, you’re capable of anything”, has been unquestionably crucial in allowing him to not only handle but also grow from failure.

Sacrifices

Zeleny has also made numerous sacrifices in order to pursue his dream job in sports analytics. When his friends from college started getting married, starting families, and settling down, Zeleny found himself still in class and taking exams. He spent 9 years in total at UNL, eventually obtaining a PhD. What is striking about his numerous sacrifices are two things: his perseverance and his mentality. First of all, 9 years of postsecondary education is a long time for anyone and requires a great deal of perseverance. He credits his parents heavily with helping him to persevere through this long season, and for believing in his capability to complete it. His perseverance was essential to his eventual career. Were it not for his decision to get his PhD, he almost certainly would not have been tabbed as the new head of the sports analytics department. The athletic administrators who hired him were looking for an expert in data analytics, especially a PhD student. Further, as we will see more in depth later, his choice to come back for more education was crucial because it meant that he was still around for his advisor to recommend.

Secondly, he had a remarkable mindset towards the sacrifices he has made. The sacrifices are numerous: delayed marriage, family life, less money, and high costs to attend school. But despite everything he sacrificed, at the end of his 9 years in education, and later in his interview with me, he described his sacrifices as almost insignificant. Though he acknowledged the sacrifices he had made, his love for sports analytics and the fact that he ultimately got his dream job led him to describe the sacrifices he made as “a pretty minor price to pay”, demonstrating

just how much he loves sports analytics, and just how much people are willing to sacrifice in order to follow their passion.

"I went back to school and finished my PhD and came out and got the perfect role for me so I'm not going to sit here and claim that I suffered through years of minimum wage jobs like some people have to go through. Obviously though with friends you've gone through college with, and graduation rolls around and they're off getting quote unquote real jobs and making some actual money and starting to put down payments on houses and getting married and starting families and things like that, and you look at your own situation and you're still 25, 26 years old going to classes and taking exams. It's a bummer, but to me a pretty minor price to pay to get to where I am. That said I remember at the time being like "this sucks, I just want to actually be getting a legit paycheck and get started on a career and here I am 9-10 years later still in school. So that's probably where I would say I made the biggest sacrifices. At the time it just feels like you're not really moving on to the next stage of your life, you're just kind of stuck where you're at."

Right Place, Right Time

As important as early exposure, peers, mentors, his parents, and the sacrifices he made were to his eventual success in sports analytics, there is one factor which is arguably more significant than all of them. Tucker Zeleny certainly would not be where he is today unless he had been fortunate enough to be in the right place at the right time. The various timing and surrounding context throughout his talent development were pivotal, and almost completely beyond his control.

The first example of this can be seen by simply looking at the surrounding world of sports during Zeleny's life. As recently as the early 2000's, advanced analytics in sports was

unheard of in the sports world. The term sports analytics almost certainly did not exist, and if it did, it certainly did not refer to the same thing it does today. When Zeleny first entered college at this time, a career in sports analytics was impossible—not because Zeleny wouldn't be talented enough for it, but because it didn't even exist. As Zeleny entered graduate school, however, the culture in sports regarding advanced analytics was beginning to change. Popular sports network ESPN was beginning to talk about new stats based on advanced analytics. Most significantly, Billy Beane was leading the A's to record breaking seasons, using the power of data analytics to find undervalued baseball players. Bean led the A's to multiple playoff appearances with one of the smallest budgets in baseball. Sports analytics certainly wasn't mainstream yet, and arguably it still isn't, but people were beginning to realize the potential competitive edge it could bring. As sports analytics started to become more common, one of Zeleny's professors and mentors became interested in it, teaching a course and conducting research on it. Without the changing culture in sports regarding analytics, Zeleny would have been unlikely to enter the field at all.

Even more crucial was the timing of it all. If the sports analytics revolution had begun a few years earlier or later, it is extremely improbable that Zeleny would have been chosen at all. If Billy Beane had begun his reliance on analytics a couple years later, Zeleny would have already graduated and settled into another career path. Further, he never would have taken a course in sports analytics. Additional good fortune was involved in the timing of the athletic administrators approaching his advisor. Jobs in sports analytics are very difficult to find, but as he was nearing the end of his PhD, several administrators in the athletic department approached his advisor asking for potential candidates to work in sports analytics, and his advisor recommended him. If the administrators had decided a year earlier to hire someone for the position, he would've been an unlikely choice, still working to complete his PhD and busy as a

data analyst at Madonna Rehabilitation Hospital and the Nebraska Athletic Performance Laboratory.

"I'd say at this time, [as I was entering graduate school], sports analytics was just starting to become more mainstream. Moneyball had been out for a few years but it was starting to get talked about a little bit more. You were starting to see the win probabilities on ESPN. You were starting to see WAR (an advanced baseball stat) as opposed to just batting average.

"So really a lot of fortunate timing for me that that opportunity kind of popped up so I was able to help out kind of on a part time basis doing math and researching a couple of their ideas… About a year later they hired me full time and made it a department. I'd say definitely a lot of timing and fortune were involved."

Innovative and Creative

Another crucial factor to Zeleny's success is his innovative and creative nature. In sports analytics, new knowledge is gold. As Billy Beane discovered with the Oakland A's, other teams will notice what you are doing sooner or later, and if it works, they will emulate it. The problem with this is that it wipes out the competitive advantage. There is no patent on new discoveries in sports, so in order to stay ahead, one must continually question everything they think works and search for creative new ways to accomplish their goals. The A's initially surged out to a huge advantage over the rest of the league, before the league figured out what they had been doing and began to emulate them. In order to stay relevant, the A's had to adapt back to the league, which they successfully did, maintaining their competitive edge. The same is true at the college level.

When asked what the importance of creativity and innovativeness is in sports analytics, Tucker Zeleny responded with the following:

"10 out of 10. There's obviously been a lot more done at a professional level, especially in baseball, than there has been at the college level. So, we are always trying to look for new ways to do things, different ways to analyze our data, ways to improve our models. For example, trying to give coaches a better true value on a player or a certain stat or a recruit, what kind of a contribution a player makes to the team. So obviously first of all we are locking down what the coaches are expecting from us on a week to week or regular basis but at the same time we are always trying to think ahead to think how can we improve this, how can we take another step? What other data may be out there? Is there a new company that is offering some new wearable or something like that? Or if we can get this kind of information, we can use it to ramp up this and that. So, we are always keeping an eye out there towards what is going on and what kind of new information is out there that we can incorporate into what we do."

Zeleny's creativity and innovative nature have certainly been crucial to his success in sports analytics and will remain crucial as he continues in the field.

Limitations

There were a few limitations to the study, including primarily the small sample size. While the findings from interviewing Zeleny and analyzing the life of Billy Beane align heavily with expected findings from prior talent development research, additional participants may have revealed a broader variety of paths to talent development in the field of sports analytics.

Another limitation of the study is the fact that there was a significant distance between me and Billy Beane, in that the study relies on the documentation of a third party, Michael Lewis, author of Moneyball. If I had been able to interview Billy Beane personally and ask him questions specifically concerning talent development, it would have been interesting to see if a variety of other factors would have surfaced.

Further, as sports analytics becomes more common in collegiate athletics, it would be interesting to see if other analysts at the collegiate level followed a similar development track to Zeleny. For now, however, Zeleny is the head of the only sports analytics department in the country at the college level, so this question will have to wait.

Discussion and Conclusion

There are a variety of commonalities between the talent development of Tucker Zeleny and Billy Beane, and though they are both very different people with very different stories, it is not difficult to see that they have had multiple common factors to their success.

Talent Factor	Tucker Zeleny	Billy Beane
Early Experience/Exposure	**Was exposed to all the sports growing up, played most of them.** **Was exposed to math from a young age.** **Was talented at both, and pursued success in each, giving him a strong grasp of both and preparing him for his time eventually in sports analytics.**	**Exposed to virtually every sport from a young age and played almost all of them.** **Became extraordinarily talented in baseball and eventually made the major leagues.** **Exposed to the writing of Bill James, arguably the first sports analyst, shortly after he started writing.**
Passion/Singleness of Purpose	**Sports analytics combines two of the things he is most passionate about—math and sports. Beyond that he is extremely competitive. Not only is he working now in sports analytics, but he is**	**Billy Beane loved playing sports and was exceptionally good at most of them. His love for baseball led him to make the major leagues. Even though he failed as a player, his love for the game and fiercely**

	working for the team which he grew up as a huge fan of.	**competitive nature led him to stay in the game and to seek greatness for the financially challenged A's.**
Mentors and Peers	**Had several important mentors, including parents, who taught him the value of hard work and supported him, his academic advisor, who guided him and helped him land his job in sports analytics, and a faculty member of the statistics department who taught a course on sports analytics and did research with him on the subject.** **He also has had multiple peers who have been essential to his effectiveness, especially staffers who have embraced his work, and members of front offices who have shared valuable information with him.**	**Had several important mentors, including his high school baseball coach, his general manager with the A's who inspired his creative and questioning nature, and his parents, who supported him in his decisions.** **Also had several crucial peers, especially Paul DePodesta, the true expert when it came to data analytics who did the nitty gritty work for Billy Beane.** **Additionally, several players he played with during his time in pro baseball helped him when looking for the mindset of future successful players.**
Mindset	**Understood that when you fail, it is an opportunity for growth.** **Was extremely self-motivated.**	**Was extremely driven but struggled when faced with failure. His lifelong giftedness in sports did not give him the opportunities to learn how to fail. His motivation, however, outweighed his poor attitude towards failure.**
Sacrifices	**Long time in school preparing for his future career resulted in extensive financial costs, delayed marriage, inability to start a family.**	**Spent years toiling in the minor leagues and as a nobody in baseball management before becoming the general manager.** **Extensive job stress led to family difficulties and a divorce with his wife.**
Right Place, Right Time	**Fortunate context in that sports analytics was just starting to become more talked about and understood in the mainstream.** **Fortunate timing that he was a student while the athletic administrators were looking for someone to run a sports analytics department.**	**Forced to consider something revolutionary as a result of his team's tiny payroll size.** **The environment of baseball fandom, which was leading to the popularity of "fantasy baseball" and increasing questioning on the parts of many baseball fans, leading to new baseball knowledge.**

	Fortunate to meet the faculty member in the statistics department and to be able to take a course on sports analytics from him.	**The rise of Bill James and Voros McCracken, the initial influencers, using sports analytics to write about baseball.** **Improvements in computer technology making statistical analysis more feasible.**
Innovative and Creative	**Continually searching for new technology which allows him to analyze trends that have not previously been able to be analyzed. Example is shottracker for basketball.** **Currently working to analyze recruiting data on recruits, which he hopes will provide a competitive advantage over other schools.**	**Completely overthrew most of the "common sense" in baseball by relying on on base percentage over batting average and forming a much more accurate player evaluation system.** **Continually making moves that were heavily criticized by others.** **Continually questioning how the team could more efficiently use its limited resources.**

As can be seen from the matrix, Zeleny and Beane share significant commonalities in their talent development. They share early exposure to their talent domains, both playing sports at a young age. They are both passionate about sports and their role in it, and both have had mentors and peers who have been pivotal to their success. They have both made significant sacrifices to get to where they are, and both are extremely innovative and creative, continually questioning what everyone else is doing in search of a better way. Lastly, both had a great deal of fortunate circumstances which allowed them to succeed in the way they have.

In conclusion, both Zeleny and Beane are examples of a classic coaching adage: process over product. Both spent years toiling in obscurity to reach their goals. Neither one of them was born destined to become great in the field of sports analytics. Both relied on a number of factors to get to where they are today—the process of them getting there is far more meaningful than the product. They provide two more compelling cases that talent is made, not born, and their lives

testify that anyone can become extremely talented given the right factors. Process over product—it's a cliché for a reason.

References

Dougherty, C. (2018, November 27). *The Art of Winning an Unfair Game*.

Journal of Sports Analytics. (n.d.). Retrieved from https://www.journalofsportsanalytics.com/

Katz, S. (2016, October 20). Nebraska's perfect start and the role of analytics. Retrieved from http://www.espn.com/college-football/story/_/id/17836319/nebraska-perfect-start-role-analytics https://www.journalofsportsanalytics.com/

McKewon, S., & World-Herald. (2016, May 14). Tucker Zeleny's job grows in importance with coaches eager to get most out of statistics. Retrieved from https://www.omaha.com/huskers/tucker-zeleny-s-job-grows-in-importance-with-coaches-eager/article_50c82446-a0f0-5f4e-8ddc-6a55b085ccf8.html

Rosenthal, B. (2015, July 08). Nebraska aims to set trend in sport analytics with hire of Zeleny. Retrieved from https://journalstar.com/sports/huskers/husker-sports/nebraska-aims-to-set-trend-in-sport-analytics-with-hire/article_e9735fe4-0e32-5bbc-8a9f-b749134c7f56.html

Skepticalsports. (2017, June 12). Billion-Dollar Billy Beane. Retrieved from https://fivethirtyeight.com/features/billion-dollar-billy-beane/

Solomon, J. (2015, August 05). Can Nebraska reverse fortunes by hiring an advanced stats whiz? Retrieved from https://www.cbssports.com/college-football/news/can-nebraska-reverse-fortunes-by-hiring-an-advanced-stats-whiz/

University of Nebraska-Lincoln. (n.d.). Tucker Zeleny. Retrieved from https://statistics.unl.edu/tucker-zeleny

With Scott Frost as coach, Matt Davison says, Nebraska will have team fans can be proud of. (n.d.). Retrieved from http://kwbe.com/huskers-news/with-scott-frost-as-coach-matt-davison-says-nebraska-will-have-team-fans-can-be-proud-of/

Transcript

First of all, what to do you do for the university and sports analytics program and what does your day to day look like?

Yeah, we are basically here to provide support to any sport or non-sport department here within the athletic department, help them out with anything that involves data and analysis of any kind really. So most of our work is focused more on the sports side or with the teams. It varies sport to sport kind of on what they need from us it could be opponent or self-scouting, in game strategy and decision making, just looking across the country and conference for some benchmarks on what we need to achieve in certain areas to achieve the goals that we are setting out to achieve. Outside of sports we have done some recruiting, some schools here in the big ten, what type of athletes are likely to come here were

they to be given an offer. So, it kind of depends obviously, all those areas have people who have worked with data in the past, but none of those teams were using data before we came along. So, you know right now we are heavy into football season and basketball is going on now, so we are working on several projects in each of those. Some of it is weekly like a scouting report while other things are more big picture projects like recruiting. A lot of research and reading on what all is being done on the field and by other teams, kind of a lot of different areas and whatever they need us to help with.

What would you say the essential skills are that are important in helping you do your job in sports analytics?

I would say that the first area of skill needed is in data management, which gets more into the computer science side of things, but being able to deal with large datasets and formatting them the way you need them to be. A lot of projects we may be pulling data from several sources in different formats and some of the data is missing so trying to get it into the form that we need it in in order to run our analysis. That probably takes 90% of our time, that data collection and management process. In addition, knowing the statistical methods, what the different methods are to present the results in a form that we get the answers we need. And probably most importantly, is the communication of that. So, once you've gathered the results finding the best way to convey those results to the coach or the director of operations, whoever is going to need to make the decision based on this information, and what fits best with how they like to receive data. Is it charts, just the pure data, a summary, it varies a lot based on the individual. So kind of making that connection to the person at the end of the process and making sure you are delivering it in a way that is fitting given the individual.

How do you think that you have learned and developed those skills over the years?

My work here at the university, I majored here in math and went on in statistics for grad school and my PhD, so the experience and time in the academic program prepared me for a lot of the data analysis side. I would say I learned some of the data collection and management from my studies, but mostly from being thrown into the fire. You learn there what that's going to look like and what challenges to expect, learning to problem solve and work through things because you never know what's going to get thrown at you. You use google a lot, if you don't know how to do it, someone probably does, and it is probably online somewhere. So, I learned through experience with that one. As far as the communication goes, I guess I kind of came into this job with the mindset that hey, there's a negative connotation with sports analytics sometimes. People treat as hey, these nerds with their computers are going to come in and tell us what we are doing wrong. So, we are really careful to take it from an angle of, you guys are the experts and decision makers, we are just here to put another tool in your toolbox, give you more information to make those decisions. Listening, listening before you speak, getting a feel for what they are looking for and how you can help and going from there, and that's kind of an ongoing process. The first season especially was kind of a feeling out process from both sides as to what we can do and what they need from us. A lot of times we put things in front of them and they say this is

awesome I love it, but other times they'll tell us this really isn't helpful, could you change this or the way you do that and you just really have to be adaptable, and make sure that you are coming up with something that is a benefit to them. And that's something that is just a case to case basis really.

What would you say drew you to the analytics side of sports and how were you introduced to it?

You know, I grew up a big sports fan, being from Nebraska I was a big Nebraska sports fan in particular. I grew up as a kid and always liked math, it just came naturally to me. The logical, right or wrong nature of it drew me in. Getting older, you are watching sports, and I was just naturally drawn to the stats side of things. Getting to college I actually started off as a physics major, did that for a couple years and realized I wasn't enjoying the physics side as much as the math side so I switched to a math major, and then that started getting pretty theoretical and I found that I really was enjoying the more practical stuff over the more theoretical stuff, and so my academic advisor at the time suggested taking more stats classes, because it was more applied. And I enjoyed it, so when I got done with my bachelors degree I stayed here for graduate school in the stats department. I'd say at this time sports analytics was just starting to become more mainstream. Moneyball had been out for a few years but it was starting to get talked about a little bit more, you were starting to see the win probabilities on espn. You were starting to see WAR as opposed to just batting average and that sort of thing. It was starting to get talked about more and fortunately one of the faculty members in the stats department was into sports as well, so we had a sports statistics/analytics course that was offered which gave me a chance to dive into it a little bit. We spent a lot of time looking at existing research and trying to replicate some of the things they did. So, you know it combined a couple of things that I was really passionate about. When I got done with my masters, I decided I have come this far I might as well stick it out and finish my PhD. During that period sports analytics really started to hit the mainstream and become more popular. There were a lot of articles, things on tv about it, conferences popping up around the country. You saw a lot of talk about front offices and kind of looked at what they were doing in the pros and started to think that it was a strong possibility that I could get a job in this area. There still weren't a ton of job opportunities, but I figured if the right type of opportunity pops up, I'll be able to work my way back into it. My final year working for my dissertation, a couple of athletic administrators reached out to my advisor, said they were hearing a lot more about this sports analytics stuff, we think there is something here, do you have anyone on the statistics side that you think could help us out on a part time basis and we can explore this a little bit further. So really a lot of fortunate timing for me that that opportunity kind of popped up so I was able to help out kind of on a part time basis doing math and researching a couple of their ideas in football basketball and baseball and they thought it was pretty interesting and bought into the fact that there was a lot they could do there, that they could have a full time department and dedicate some people. About a year later they hired me full time and made it a department. I'd say definitely a lot of timing and fortune were involved.

It sounds like both your advisor and the professor who taught the sports analytics course were pretty important to your path.

Yeah, they definitely pointed me in the right direction and were the right connections to have, especially my advisor here. I absolutely followed them along to get where I am, you know it's just a matter of if you are liking this field ?? being alive in front of the especially in major league baseball it's pretty well accepted that this is how it is. You got managers now that are basically given the lineup before each game. It's certainly not every sport, there is still have some push back, obviously the college level isn't where the professional level is, you know, in order to really be successful in this area and feel like you can make a difference, you got to have those people that are in important roles that are trusting the data and trusting the ideas behind it. So, to have people here at Nebraska in the athletic and in other departments who are ready to buy in and see the value obviously you can't understate that it has been huge having all those people bought in here.

What would you say some of the other most important things have been to bring you to your career in sports analytics?

I mean, I kind of touched on it ?? for lack of a better term ?? I would say going off that a little bit, every role we've been in there's been kind of a one or two initial projects obviously where you can really see the coach or the staff or whoever really start to see the value. Like I said before, initially either they're not quite sure what you're here for or what they're doing, what data they have you got to feel your way through it, it seems like usually throughout those initial years there is something that they need that they're not sure we can help with, and it turns out that it is something that we can help with and we kind of meet or exceed their expectations and they are pretty impressed with it or maybe we stumbled upon something in that particular sport of strategy where we say you know this is what the numbers are showing and they see that bear out on the field or the court or whatever and it seems like those kind of moments where you're able to deliver and they really see the valuable things that you can do, that's huge in building our relationship and getting that trust factor. YK being able to do more with those sports I would say, that's not as much on getting me into my career but since it's been going on, it's those moments when you are able to put something in a coaches hand that they really see the value that YK allow us to flourish in our role here because we are able to make those breakthroughs YK we can spend all day coming up with these awesome algorithms and do all these sophisticated things with our data collection and everything but if the coach isn't going to be able to put that into practice whether we're not delivering it correctly or they don't trust it or whatever, we're kind of spinning our wheels here. So the initial moments we have with each staff where we start working with them and are showing them what we can do are very very important for us.

You've talked about you advisor and professor, would you say there have been any other mentors or peers who have been really important to you?

People I've worked with have been super helpful in their support. Often times you are throwing a lot in the lap of an assistant coach or director of operations and they're not really sure what you're there for... there have been times where that's been made smoother on account of certain team members, so they've been important along the way... a lot of what we do is pretty new in the sense that there isn't really anyone else doing this at the college level, so there's a lot of research involved as well as paying

attention to the work being done in the NFL, NBA, MLB and seeing what they're doing, I've had a chance to talk with some people in the NFL or the front offices of pro teams and kind of see what they're doing.

Would you say that there are challenges in communication what you find and getting the different sports to buy in?

Yeah especially if you are talking to coaches that may be a little more old school it may be more challenging. Especially older more experienced coaches who obviously have a lot of expertise in the field and so yk for them to buy in to what you're selling them you certainly have to have a lot of substance there. You can't just walk into the room like hey we've cracked the code, we've got all these answers. I think anyone who is coaching rightfully should be skeptical of that kind of claim. That's what we try to avoid. But if you can approach it in the right way and more as a tool in their toolboxes and to help them make better informed decisions. I wouldn't say we necessarily had pushback. I wouldn't say there have been situations where we bring some data we've run and present it to the coaches and have them say hey this is a bunch of crap and throw it in the trash, but you know for them to see value, it has to be properly empowering for the coach and should support them in the way they run their program. So yes and no, there's definitely a lot of importance on working on those relationships to get them to where they need to be so that they feel comfortable with us and we are comfortable with them as well.

Would you say that your parents or your family encouraged your pursuit of work in physics at first and then math and then eventually sports analytics?

Certainly had a big role in my life. I grew up from a farming background, more of the hard work kind of model growing up. It's not like my parents were breaking down the average yardage per play of the Green Bay Packers or anything, or very many people at all were for that matter. But they definitely encouraged me the whole way and supported me. I would say they were really helpful in encouraging me to persevere through graduate school especially. When a lot of people my age were getting married, getting "real jobs", starting families, I was still pursuing higher education and that was discouraging. But I think they knew it was something I was capable of doing, and so they encouraged me to take it as far as I possibly could. But definitely helps to have a strong foundation to fall back on.

Would you say that they taught you good work ethic and perseverance and things like that too?

Yeah, certainly I think my parents played a big role in that. Kind of teaching me about having a self-confidence and knowing that you've got to be out there and do this for yourself, no one else is going to do this for you. When you get knocked down you got to get back up and when you kind of put your mind to it and work hard, you're capable of anything. You are kind of your own limiting factor as far as what's achieved. So it's kind of that mindset of hey, I've certainly relied on the help of others and others have

been important in getting to me to where I've gotten, but at the end of the day I've got to trust myself and not be putting the blame necessarily on anyone else but knowing I've got to accomplish what I want to accomplish.

What kind of sacrifices would you say that you've made over the years?

I'm not going to complain too much in that regard because it's worked out for me. I went back to school and finished my PhD and came out and got the perfect role for me so I'm not going to sit here and claim that I suffered through years of minimum wage jobs like some people have to go through. Obviously though with friends you've gone through college with, and graduation rolls around and they're off getting quote unquote real jobs and making some actual money and starting to but down payments on houses and getting married and starting families and things like that and you look at your own situation and you're still 25, 26 years old going to classes and taking exams. It's a bummer, but to me a pretty minor price to pay to get to where I am. That said I remember at the time being like "this sucks, I just want to actually be getting a legit paycheck and get started on a career and here I am 9-10 later years still in school. So that's probably where I would say I made the biggest sacrifices. At the time it just feels like you're not really moving on to the next stage of your life, you're just kind of stuck where you're at.

Did you play sports growing up, and did that influence you at all, or if you were more of a fan? What was your interaction like in that way?

I played all the sports as a kid, wasn't necessarily into video games or anything like that, I'd like to get outside and play football with some friends or go to the court and play pickup basketball with some guys, or baseball, whatever. I was just always outside playing something. Continued playing through junior high and high school in more organized sports. I played football and basketball, ran track in junior high. In high school we were a smaller school, so we didn't offer baseball as a high school sport but in the summer, we played in a league so had a lot of exposure to different sports. Obviously, it was at a much lower level than here, but it gives you an appreciation for it, I think.

What kind of importance would you give the skill of being creative, thinking outside the box in sports analytics?

[laughs]... 10 out of 10. There's obviously been a lot more done at a professional level, especially in baseball, than there has been at the college level. So, we are always trying to look for new ways to do things, different ways to analyze our data, ways to improve our models. For example, trying to give coaches a better true value on a player or a certain stat or a recruit, what kind of a contribution a player makes to the team. So obviously first of all we are locking down what the coaches are expecting from us on a week to week or regular basis but at the same time we are always trying to think ahead to think

how can we improve this, how can we take another step? What other data may be out there? Is there a new company that is offering some new wearable or something like that? Or if we can get this kind of information, we can use it to ramp up this and that. So, we are always keeping an eye out there towards what is going on and what kind of new information is out there that we can incorporate into what we do.

Is there anything that you would want to add that you feel is important?

...professionally it is very accepted, especially in the MLB, that this is the way it is. a lot of the time managers are given lineups from the front office and told that's who is playing. It is starting to get that way in some of the other sports. Will it get to where it is now in baseball? Probably not, but I think we see it moving that direction and so for us at the college level it is going to be interesting to see, where it goes. There's no one else we know of at the college level doing the same thing we are. Maybe they are and they're just playing it close to the vest. It's a pretty fun time to be involved in something like this. And so, to have people who are interested in it like you are, is awesome to see. It's great to have people thinking about this as a career, as opposed to where I was as a student with it not being as much of a full-time career area. So, I hope it keeps moving that way.