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The Role of a Player Development System in Major League Baseball

Abstract

This paper looks at the role of a player development system and the possible paths to success in Major League Baseball (MLB). The study looked at rookie players in the MLB to see if the path of their journey to the major leagues has an influence on their success as a rookie. Two paths were studied, those who played collegiately and those who went through the minor leagues straight from high school. This study used quantitative data to analyze the differences in player's performance as rookies through statistics such as batting average and on-base percentage for hitters and winning percentage and earned run average for pitchers among other categories. This was used to show the differences in performance of rookies and allow us to see if there is a connection between greater success and previous baseball experience. This study highlighted those issues and topics within the industry including; how minor league sports work, finances, the professional drafts, contributions to player performance, and cognitive development of athletes. Results showed that there was not a significant difference in production between high school and collegiate players during their rookie year. These results suggest that perhaps any sort of organizational philosophy one way or the other may be faulty, and an organization should simply look at the player and not worry so much about their level of experience.

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The Role of a Player Development System in Major League Baseball:

How does MLB rookie success relate to previous baseball experience?

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Abstract

This paper looks at the role of a player development system and the possible paths to success in Major League Baseball (MLB). The study looked at rookie players in the MLB to see if the path of their journey to the major leagues has an influence on their success as a rookie. Two paths were studied, those who played collegiately and those who went through the minor leagues straight from high school. This study used quantitative data to analyze the differences in player's performance as rookies through statistics such as batting average and on-base percentage for hitters and winning percentage and earned run average for pitchers among other categories. This was used to show the differences in performance of rookies and allow us to see if there is a connection between greater success and previous baseball experience. This study highlighted those issues and topics within the industry including; how minor league sports work, finances, the professional drafts, contributions to player performance, and cognitive development of athletes. Results showed that there was not a significant difference in production between high school and collegiate players during their rookie year. These results suggest that perhaps any sort of organizational philosophy one way or the other may be faulty, and an organization should simply look at the player and not worry so much about their level of experience.

Introduction

The development of young players is a key to the success of any major league sports franchise. No organization wants to invest time and money into a player who fails to make it to the major leagues. This study explored whether MLB rookie success relates to previous baseball experience. The findings reported in this study will help when it comes to Major League Baseball and the philosophy of an organization when it comes to drafting and developing players within their organization.

Investing time, money, and resources in a player can be very taxing and to have that player fail to make the impact they were expected to do when reaching the major league level can be rough on an organization. With the current league structure the way it is players drafted relatively high are often guaranteed millions in signing bonuses and salary before they even step on the field (Van Sweep, 2010). If this research being conducted finds that there is one route that is more of a guaranteed success than the other it can be very beneficial to major league organizations. If a small market team relies heavily on their rookie players then they may be more inclined to draft the more impactful player as opposed to the ones who may take longer to develop in the majors. The research conducted for the literature review of this study will come primarily from the following list of categories; the role and workings of minor league sports, contributions to player's performance, pro draft rules and protocols cognitive development of a player, and financial management for both a player and team. These topics will span across all of the major professional sports in North America including Major League Baseball, the National Hockey League (NHL), the National Football League (NFL), and the National Basketball Association (NBA). The articles written at a scholarly level is very limited when it comes to the impact of player development or minor league sports on the preparedness of an athlete when

reaching the highest level of competition in their sport. Most of the research that has been conducted on minor league sports simply focuses on fans and attendance. This study will help shed light on a part of sports that has been for the most part ignored in the scholarly circle.

Statistics were gathered to support this hypothesis by compiling rookie year statistics for both pitchers and position players during first full year in Major League Baseball. The sample that is going to be used will be rookie players who completed that season during the 2009, 2010, and 2011 campaigns. The point of this research is to see how influential rookies with either college or high school experience are to their particular organization when it comes to their statistical data in their first year of professional play. The factors that will be looked at in the analysis of this study will be purely statistical. The data that will show the answer to this question are all statistically based and reflect the performance of the athletes in Major League Baseball.

Literature Review

Role of Minor League Sports

Minor league sports have become a big part of the professional sports landscape in North America. Its role in getting athletes ready for the pros is something that can be incredibly helpful for an organization and its players. Major League Baseball has developed an extensive minor league program that incorporates player's right from high school or collegiate institutions (Winfrey, 2005). Though this study will focus on the MLB for its data source the literature review however will focus on the NHL, NFL, and NBA as well.

Major League Baseball, along with the National Hockey League has incorporated minor league sports as a way to develop their prospects and make them into better rookies and young players. However some professional North American sports have decided to go away from this

development approach and throw their players right into the fire. The National Football League does not have any directly affiliated minor league development player. The National Basketball League primarily follows the NFL's approach but does have a developmental league known as the D-League. The D-League has made an attempt to strengthen the league by increasing affiliations with NBA teams but still, not even each team has their own minor league affiliate and some D-League teams have up to four NBA affiliations (Lombardo, 2012). However the NBA does not use the D-League as a typical developmental league. Most players drafted into the NBA showing any promise will report directly to the NBA franchise.

The lack of a minor league system can greatly hurt the development of a player. Not only does a minor league system give them the chance to develop their skills but it gives them an adjustment period to get accustomed to the life and lifestyle that comes with being a professional athlete. Without the acclimation period that the minor leagues provide, rookie athletes in the NFL and NBA are at a disadvantage. A minor league system also allows for a team to better control player salaries. A league with a player development system allows teams to give smaller signing bonuses and sign their players to minor league contracts. This lowers financial risk while seeing if players can evolve into major league prospects (Broshuis, 2010) Teams with no player development system are often forced to give up very big signing bonuses to early round picks without seeing any performance on the field. This is why Jim Trotter of Sports Illustrated's name for these players is "Million Dollar Maybes," (Trotter, 2010).

One important aspect of minor league sports is that it serves as a barometer for predicting future major league production. However even this can be difficult, a study by Longley and Wong found that future success of major league pitchers is extremely hard to predict based on their minor league statistics (Longley, 2011). They found that through a study of 1200 pitchers

over a 20 year span that minor league statistics were actually of limited value in predicting major league success (Longley, 2011). This shows how difficult it is for an organization to predict major league success even when looking at minor league statistics, a place where everyone is a professional. This shows that major league production is difficult to predict. So when the NBA and NFL draft players based on college statistics only, it is very risky when predicting future professional success. It is difficult to prove just how talented a player is when there playing against competition where a limited amount even have the talent to play in a professional setting.

An important part of minor league sports is establishing the sense of community. Minor league teams offer members of an organization a chance to bond and form a sense of community with their current and future teammates. A study by Warner and Dixon looked at this potential benefit, and what was most important to athletes in creating this sense of community. These included leadership opportunities, equity in decisions, competition, and social spaces (Warner, 2011). Minor league teams give players these chances where they would not be afforded them in a major league setting. When a player has a chance to develop their leadership skills in the minors it has the potential to translate to a major league team when they reach the pros.

Another benefit of minor league sports is that it allows for low budget teams to compete. The strategy known as Moneyball in Major League Baseball involves the use of a combination of young talented players with low salaries, mixed with low budget free agents (Gerrard, 2007). If the NBA and NFL had a development system that incorporated the same pay scales as the MLB and NHL then low budget teams could develop talent from within and control salaries. It would be a low risk technique that could allow for teams to sustain success (Mason, 2007).

Another major part of a player development system is progression through the levels of the system. A study found that the progression between levels was a direct result of the player's

deviation from the mean (Spurr, 1994). This means that if you do well you will move up and the opposite if a player is to struggle. As far as these players moving up the ladder they also get more fan exposure and begin gaining more and more attention from fans. A study found that when top prospects in baseball progress through the system there is a direct increase in fan attendance for their games (Gitter, 2011). In this case players can begin developing their star power while their still in the minors and can make a positive impact upon attendance when they arrive in the majors (Braunstein, 2005).

Contributions to Player Performance

Another important factor to look at when helping to show the importance of a player development system is to look at what contributes to player performance. Not only are there factors that influence the performance of player's on the field but there are also many factors away from the playing field that contribute to the performance of an athlete. One factor that is rarely considered is the impact of professional sports on the amount of sleep a player gets. This may seem like a trivial thing but a lack of sleep can hurt the performance of an athlete and cause a hindrance on the growth and repair, neuro-muscular performance, cognitive functioning, and emotions (Venter, 2012). Young athletes are not use to the grueling schedule that comes with professional sports. This is really a scenario that college sports cannot provide. As a professional athlete you are constantly on the road away from your family, and the minor leagues allow for this adjustment period.

Another factor that contributes to performance on the field is the difficulty of the adaptation process of professional sports. National Hockey League coaches are integrating adaptation teaching techniques into their strategies as a way to attain the best possible performance from their athletes (Battochio, 2010). Coaches and teams have begun educating

their players on issues including media demands, life style changes, demotion to the minors, transactions, and the sense of belonging and trusting (Battochio, 2010). A psychologically based journal looked at the effect of team member's trust on a team's performance. They found that teams with better team cohesion had more success on the field and those who struggled to get along struggled on the field (Mach, 2010). This team cohesion is just one thing that could be built up through a player development system. As far as the actual physical training that is present, MLB trainers tend to look at body composition as the most important parameter (Ebben, 2005). This would be similar for most leagues as the physical fitness of an athlete is highly valued.

A negative issue when it comes to contributions to player performance is the issue of crime and violence among athletes. This has been a prevalent issue in sports and specifically the NFL. The NFL has instituted a personal conduct policy to help control this violence with harsher penalties for offenders (Janusz, 2012). Another study on this topic argues that the show "Playmakers" which negatively portrayed football players was actually accurate. They looked at prevalence of injury on the field, steroid use, painkiller use, drug use and domestic violence in the sport and found all of these to be prevalent in the NFL (Fogel, 2012). Another study found that there is often a lot of pressure on young athletes to engage in risky behavior (Diehl, 2012). Often when a rookie comes into a lot of money these pressures are even more prevalent and have the ability to derail a young athlete's career. These behaviors can take away from the performance of an athlete on the field, hurting their off the field lives, and portraying the league in a negative way (Diehl, 2012).

An important factor that organizations need to keep in mind when developing players is their own minor league coaches and their coaching philosophies. A study from the International

Journal of Coaching Science looked at coaches and athletes perceptions of athlete performance. The results found that athlete's perceptions of performance were not always associated with coach's satisfaction with performance (Lorimer, 2011). This study is significant because it shows that sometimes coaches and athletes have different ideas of success. Meaning that if a player was just thrown into the pros not only do they miss out on further coaching but they may not jell with the professional coach and it could hurt their development and the teams performance. This study showed that it is very important that a coaching philosophy instilled at the major league level is stressed throughout your development program to develop players who fit the mold and goals of your organization.

Professional Draft

One important step in understanding the impact of player development is interpreting how the professional drafts in these leagues work. One interesting aspect to look at is the rules that certain leagues have put into place. The NHL and MLB do not mandate that the player attends college, where the NBA and the NFL do by issuing their age requirements. There are many legal issues that revolve around a player forgoing their amateur status to turn professional. These can include factors such as the hiring of agents and advisors, extra eligibility, player injuries, and undrafted players (Levy, 2012). An article from the Case Western Reserve Law Review questions whether the placing of an age restriction on entry is actually legal (McCann, 2006). This is an interesting thought because the two leagues that don't use an age limit are the ones who have a strong player development system. It bring into question whether or not the NBA and NFL really just implement this restriction as a way to have a free player development system in the NCAA. It is important to note that the NBA used to have no such age limit. The Seton Hall Journal of Sport Law argues that this restriction isn't actually necessary and points

out how athletes such as Kobe Bryant made the jump and turned into all-star players (Rosner, 1998). The article's importance lies in how it points out successful players made the jump from high school and were impactful. It shows that maybe the clearly most talented players don't need a player development system or college experience.

Another study performed in the *International Journal of Sport Finance* looked at the ability to predict NBA success based on college production. The study found that college basketball only had some significance when predicting a NBA career (Coates, 2010). When you take this fact into effect and the fact that the NBA has just two rounds in its professional draft, it means that a significant amount of players may have been overlooked and not given the shot to prove themselves as an NBA player. If the NBA would implement stronger connections with their development system they could increase the rounds of the draft and work on developing more players with potential.

Going along these lines the *Journal of Sport Behavior* looked at whether or not draft position of a player was a good indicator of NHL success. They however found that draft position was actually a poor indicator of NHL performance (Voyer, 1998). This shows that often player evaluators make mistakes and these late round picks only make it to the majors through proving themselves in the minors. Without such an opportunity in the NBA or NFL there is a very good chance that many players with professional potential have been overlooked and never given a chance to prove themselves.

An article by Deubert and Wong describes the evolution of the signing bonus in the NFL and the prevalence of guaranteed money. The authors describe how originally the signing bonus was just a small incentive for the player to sign a contract with a club, but it has now turned into a significant amount of guaranteed money (Deubert, 2009). When a player is guaranteed large

sums of money it puts the organization in a financial risk. When they guarantee this money there is no way of recouping the money even if the player doesn't pan out to their potential. If the leagues instead had the ability to send the player to the minors they could see if the player actually is worth the potential long-term investment.

Another study conducted in 2006 looked at the ability of off the ice performance tests to predict on ice success. The study found that at least in the NHL off ice tests are not accurate predictors of the athletes overall skill in a game setting (Vescovi, 2006). This is not only important for hockey but all sports, especially the NFL and their pre-draft combine. Based on these findings the combine would be of little to no significance in predicting the players on field ability. Another important factor is to look at how draft order affects players playing time at the professional level. A study completed about this situation in the NBA found that teams are more likely to hold onto a player who was drafted early on over a player who is actually more productive just because of the money they have invested in them (Staw, 1995). This study points out a huge flaw in the NBA's system. When teams keep a highly drafted player over a more productive one just because they have invested so much money in them, is a serious problem. If the NBA were to work more closely with the D-League and control salaries than there would not be this obligation to keep these unproductive high draft picks.

Cognitive Development

Another important factor to take into account when looking at the benefits of a player development system is its impact on a player's cognitive development. With drafted players being sent to minor leagues they have the benefit of developing as not only a player but as a person without the pressures to perform at a major league level. A study performed in the *Journal of Personality* found that significant mental development occurs between the ages of 17 and 27

(Donnellan, 2007). When a player is selected to any of the professional drafts they are at the lower level of this continuum, meaning they have really just begun the journey of emotional and mental maturity. It has also been found that emotional maturity has a significant impact on the level on the player's performance. A study done in the International Journal of Sport & Society looked at the impact of emotional maturity of professional hand ball players. This study used a test that looked at five subscales including emotional instability, emotional regression, social maladjustment, personality disintegration, and lack of independence. The study concluded that the international level players, the most talented, also had the highest emotional maturity (Rathee, 2011). This is extremely significant because it shows that those athletes with the most emotional maturity have the most success on the field. The minor league opportunity would give these athletes a chance to grow and mature

Another study performed by the University of California found that people develop further cognitively, the more they are exposed to cultural contributors (Gauvain, 2011). This helps to reinforce the value of a player being exposed to the challenges and hurdles of life when they are still young playing in a minor league setting. When you select a player for instance in the NBA, the player has most likely gone from living with their family to usually only one or two years in college, a very controlled environment. The minor league system gives players the opportunity to get out on their own and feel what it is like to take on some further responsibility and have to make their own decisions. Something as simple as renting an apartment and having to pay your own bills can go far in the emotional maturity process of an athlete. On the contrary a study by the Change journal found that when a young adult goes to college they also experience significant cognitive development as part of their intellectual learning (Baxter Magolda, 2006). This proves that there are benefits to an athlete attending a university. Though it

may be a different approach, it still leads to increased cognitive development which in return leads to better performance on the field.

An issue when it comes to cognitive development is diagnosing emotional and mental disorders in athletes. An article from the Journal of Clinical Sport Psychology discusses the diagnosing of emotional disorders in athletes (Ronald, 2008). One way of combating this is by having a specialist in diagnosing emotional disorders, this can increase the diagnostic and treatment abilities of an organizations sports medicine team. Mental issues that have been prevalent in sport include; anxiety and mood disorders, eating disorders, substance use, and ADD (Ronald, 2008). This was really brought to light this previous NBA season with Houston Rockets player Royce White. White is the first prospect to freely admit he suffers from anxiety (Torre, 2012). Unfortunately White and the Rockets have struggled to deal with the situation and White has not played this season as a result. This shows that clearly this player wasn't ready for a major league setting, perhaps if the Rockets had eased him into the situation through a player development system it could have worked out. Also the Rockets took a big financial risk signing White and as a result have had no return on their investment.

Some experts say that the NCAA should make more of a conscious effort to educate division one athletes on the professional sports road (Wong, 2011). For many division one athletes the goal is to make it into professional sports, and realistically that is happening for many major sports programs. Most parents and students are uneducated in this process and some feel the NCAA needs to step in and take urgent action to help protect and educate young athletes (Wong, 2011). Unfortunately or not, for many division one athletes it's not primarily about the education and though the NCAA may not be happy about it, perhaps they need to start acknowledging that this is the role they have become for many athletes.

Financial Management

One of the most important parts in the development of a young athlete is financial management. This is equally significant for both the player themselves and the teams that are paying out this money. From the perspective of the organization the signing of a player is an extremely risky financial endeavor (Kedar-Levy, 2008). This is obviously risky because players are so highly paid. When compared to individual athletes who compete as one, team based athletes make significantly more money (Hilpirt, 2007).

The Review of Financial Studies found that the use of signing bonuses as an incentive has become very prevalent in major league organizations (Van Sweep, 2010). This is a dangerous recruiting tool because these bonuses are typically guaranteed money. This is just that much more risk that is being put on these organizations. A study focusing on the financial management strategies of organizations found that in Major League Baseball the best way to be successful and control spending is to establish a strong player development system and win from within (Chen, 2008). For organizations that choose to follow this model it is very important for them to get a return on their investment. These organizations rely on their rookie players to make a significant impact and need strong production in a player's first year.

Perhaps the greatest impact of financial management in this study is on the ability of the players themselves to manage their finances. Just as the athletes sport is a team effort so is the management of their money (Dowell, 2011). Any athlete who makes a significant amount of money should have a team in place for any situation that may come about regarding their financial situation. According to the study by Dowell an athlete should put together a team made up of an agent, an accountant, an attorney, an insurance professional and a wealth expert. An accountant can be especially important when it comes to issues like the "Jock Tax." The jock tax

is essentially a tax that states employ on professional athletes for doing work in their state. This means athletes have to pay a tax in any state they play in during the season even outside of their state of residence (Shaheen, 2012). This is influential because a lot of athletes don't realize that a million dollar signing bonus doesn't mean they actually get a million dollars. If rookies were more educated on this process they could better prepare financially.

Professional athletes are often tempted by the athlete lifestyle. Often players take that first paycheck and simply see the dollar signs. It is the job of this wealth management team to make sure the athlete stays on track and spends within their means and makes smart investments. A study by Reinhold looks at some of the differences in the financial situations between athletes and the regular individual. The study found that the average person will work for 35 to 45 years and make between \$1.5 and \$3.5 million. Where an athlete will play for an average of 7 to 12 years and make between \$5 and \$25 million, however their career will be over before age 40 (Reinhold, 2000). The problem many athletes face who have the short professional careers is that they don't understand that this lifestyle is not sustainable, and that is where a financial planner needs to be working with a player to make sure their money can last. A financial planner who works with a major financial management firm states that when he first sits down with a client after they get their first contract, he plans accordingly assuming this is the only contract they will ever get in their career (Jackson, 2013). Though players don't like to hear this, this is a philosophy that needs to be taken. Sports are unpredictable and you never know if that next pay check will come.

Financial manager David Neumann points out how a common misconception is that people believe athletes retire at the same point as everyone else (Neumann, 1988). Typically when a normal person invests their earnings for retirement they begin to use the money at age 55,

however with an athlete they begin using their savings usually by their mid to late 30's. This can also be a difficult transition for athletes to have something they have been doing their entire lives to suddenly be gone. Often athletes look to invest their money in another venture and that is where a financial manager comes in to make sure that if they do it is a smart investment (Neumann, 1988). Finances and big money contracts are extremely risky for both teams and players and is something that shouldn't be taken lightly in professional sports.

Methods

Research Tradition

A post-positivist approach was used in this study. A post-positivist paradigm acknowledges that fixing meaning(s) is not a neutral act, and that the questions raised reflect particular interests (Henderson, 2011). In this approach the researcher has some influence on the findings. In this case the influence comes in the sample being selected. The criteria for selection was made at the researcher's discretion. There was no central group to look at, the group was chosen based on criteria best believed to fit this study.

Also this research was conducted using quantitative approaches, and much of the contribution to this work was in the realm of research design and statistical analyses. Quantitative studies use sophisticated modeling procedures to demonstrate support for the sequential links in the chain of events (Horn, 2011). In this study this chain of events represents the possible path in levels of baseball participation. This research tested to see if there is in fact a sequential link that allows for rookie baseball success to be predicted based on past baseball experience.

A quantitative research design allows flexibility in the treatment of data, in terms of comparative analyses, statistical analyses, and repeatability of data collection in order to verify reliability (Jones, 1997). Quantitative methodologies allow for comparison and replication. This

is important when it comes to the repeatability of the study and the ability to build upon the findings. As this study only encompasses one three year study by taking this approach someone could easily choose a different three year period to test the validity of the result.

Conceptual Framework

This framework outlines the variables, intervening variables, sample, and procedure that took place in this study. This study looks at a number of different factors and variables that contribute to the success of rookie players. After data was gathered and placed into a spread sheet, a logistical regression was used to help interpret results and determine the predictive ability of the results.

Variables

Multiple variables were present in the study. These were addressed to clarify the results and make the study as accurate as possible.

College/High School

- This serves as the primary dependent variable for this study. The athletes were broken down by college and high school to determine if one particular path leads to the most rookie success.

Number of months in minors

- This was a key determining variable in the study. Time is one of the most accurate predictors of the impact of the minor leagues. It was expected that time would be a large contributor when comparing the paths of college and high school players.
- Time was measured by the number of days the player spent in the minor leagues. The number of months the player stayed in the minors was broken down into numerical form to be imputed into SPSS. For example if a player spent four

months in the minor assuming 30 days per month, this players time would be imputed as 120 days of minor league service.

Number of at bats / innings pitched

- This will show the amount of playing time a certain player had while in the minors. It may be a more accurate predictor as opposed to time. A player may spend significant time while getting few appearances, or progress to the majors in a short amount of time as a result of playing every single game.

Offensive statistics

- Batting Average (AVG), At Bats Per Home Run (AB/HR), At Bats Per Run Batted In (AB/RBI), On Base Percentage (OBP).
- Qualification (Qualified year to date) – In order to qualify for batting titles in averaged categories, a player must average at least 3.1 plate appearances for every game his team played. Sorting by qualified year to date excludes all player not currently on pace to reach that minimum. (MLB Miscellaneous Rules, 2013)

Pitching statistics

- Winning Percentage (W%), Earned Run Average (ERA), Walks Per Nine Innings Pitched (BB/9), Strike Outs Per Nine Innings Pitched (SO/9), Walks Plus Hits Per Inning Pitched (WHIP).
- Qualification (Qualified year to date) – In order to qualify for pitching titles in averaged categories, a player must average at least one inning pitched for every game his team has played. Sorting by qualified year to date excludes all players not currently on pace to reach that minimum. (MLB Miscellaneous Rules, 2013)

Intervening variables

There were multiple intervening variables present in this study. Some prospects spend very little time in the minors and have great success at the major league level, for example Bryce Harper, Yasiel Puig, and Jose Fernandez who spent very little time in the minors and became MLB all-stars their first year. This could disprove the time element as a variable to major league success. This type of player would however be present in the study if they met the qualifications presented. Though they could possibly skew results these players cannot be omitted because of their talent. There is also a possibility of an immeasurable x-factor, if there is some intrinsic quality that is possessed by certain athletes that cannot be taught or coached. In this case it would be considered a limitation to the study. These intangible variables may be more of a contribution for some players but can't be measured.

There are some aspects of a players influence and impact that cannot be measured through statistical data. Some of the impact to a team can come from immeasurable statistics such as leadership. This was considered a limitation to the study.

Players from overseas or other leagues will not be included in this study. If someone played independent league baseball or played professionally in another country (Japan, China, Cuba) there is a good chance that they will be a rookie who has spent no time in the minor leagues. This was taken into account when looking at the sample.

Foreign players will be limited in this study. Any player who was drafted out of another country will be eliminated from the study. As these players do not participate in high school sports it would not follow within the constraints of the study. Since many foreign players participate in academies and clinics only and do not play high school or college baseball it would not align with the goals of the study. This much of a focus on baseball only would put them at a

competitive advantage over other players who have to balance baseball with school work or other off field endeavors.

Defensive statistics did not play a role simply because of the difficulty in measuring defense. The only defensive statistic currently measured in traditional baseball statistics is errors which is not an accurate enough measurement of total defense. There is really no way to statistically measure arm strength or fielding range, two things which set some players apart from others on the defensive side of the ball.

Stratified random sampling

For this study only American League rookies were studied. The official determining status of a rookie according to Major League Baseball is as followed; A player shall be considered a rookie unless, during a previous season or seasons, he has (a) exceeded 130 at-bats or 50 innings pitched in the Major Leagues or (b) accumulated more than 45 days on the active roster of a Major League club or clubs during the period of 25-player limit (excluding time in the military service and time on the disabled list) (MLB Miscellaneous Rules, 2013). By using the league with the designated hitter (DH) we can eliminate a possible intervening variable when it comes to rookie starting pitchers. As starting pitchers do not have to hit it allows for more pure pitching stats since pitchers will not need to spend their time worrying about hitting or face the risk of injury. Also since there is a DH, other rookie position players will be eligible to look at that either DH or spend some time as the DH and therefore have resulted in a larger sample to study. The study was not a completely random sample because there were certain qualifications that needed to be met to take part in the study. If a completely random sample was taken from the rookie class we would wind up with a player hitting .300 but he only played in the minimum required amount of games. This would not be an accurate representation on the ability of a

player. That is why the minimum statistics to qualify for official MLB statistics explained earlier were taken out of the question. The qualifications that are listed above would create a sample with a large amount of variance between playing time and could bring inaccurate results. Also the regular season statistics will only be taken into account in this study. Additional games played in the post season would skew the results as certain rookies would gather more at bats due to their team's participation in the playoffs.

This study looked at players from the 2009, 2010, 2011 seasons. These seasons were selected as they are the three leading up to the latest collective bargaining agreement (CBA) in the MLB (DeSchriver, 2012). The most recent CBA was enacted after the 2011 season so any recent rule changes would have been put into place after the 2011 season (DeSchriver, 2012). A significant sample size requires three seasons of players so the previous three seasons were selected as a result.

The players chosen met the playing time criteria that had been put together for this study. All batters selected had a minimum of 275 at bats. This is roughly half of the at bats a typical everyday player would get during a season. This allowed for a significant number of players to be chosen while still having a strong impact on their team during the season. Pitchers who have been selected for the study have a minimum of 100 innings pitched in their respected season. 100 innings is slightly under half of the innings pitched by the pitchers with the most innings pitched during these seasons. This is the highest number of innings pitched that could be studied while still having a significant number of participants. When these qualifications were applied to the three year sample size for both pitchers and hitters it resulted in a total sample of 48 players, 22 pitchers and 26 hitters.

Procedure

Data collection began by breaking down the players in the three year time period into pitchers and position players. Player's statistics were then inputted into SPSS to categorize their statistics. Categories for both pitchers and position players included the dependent variable college or high school first, total games played and days spent in minors. Position player only statistics also included; at bats, batting average, on base percentage, at bats per home run, and at bats per run batted in. Pitching statistics included; innings pitched, winning percentage, earned run average, walks per nine innings pitched, strike outs per nine innings pitched, and WHIP. All of this data was obtained through the websites Baseball Reference and Baseball Almanac. When it came to breaking down the data the statistics were tabulated by the Statmaster program on the Baseball Almanac website. Descriptive statistics were primarily used to decipher the data. Mean was an accurate ways to see the results of the study and easily compared between multiple categories. Once descriptive statistics were gathered and tabulated we were able to see if there was a clear difference in rookie year production between college and high school players and also if time spent in the minor leagues did play a significant role in player performance.

A logistical regression was used to look at determining factors in this study. This type of regression allows for the predicting of outcomes based on one or more dependent variable (Gratton, 2010). This study was able to show the strength of relationships and if there was a correlation between the two variables which were in this case, the impact of college or high school on their success as a rookie. This analysis was able to show if there was any predictive ability in model. If there is a strong enough correlation the model will have the ability to trace the rookie stats back to previous experience which in this case is either high school or college baseball participation.

Results

After looking at the data collected from the collegiate and high school players there was little difference between choosing players from one path or the other. The data showed there was not a clear difference between high school and college athlete performance as rookies for both the hitting and pitching categories. Also after running a logistical regression of the data there was not significance in the finding. As a result of the regression analysis there is a lack of correlation between the statistics and their ability to predict high school or college participation. For a detailed description refer to appendix C1 and C2.

Whether it was the hitters or the pitchers there was not a large disparity between the two sides in the statistical categories that were measured. In the pitching categories both the high school and college pitchers displayed similar results. When earned run average (ERA) was tabulated the high schools mean of 4.36 surpassed the 4.86 mean ERA of the collegiate pitchers. High school pitchers also held an advantage when it came to WHIP. High school pitchers posted a WHIP of 1.43 compared to the 1.45 of the collegiate pitchers. The collegiate pitchers finished with a mean winning percentage of .543 compared to the high school pitchers who on average failed to win the majority of their starts with a .468 winning percentage. This statistic however could be influenced by the overall performance of their respected teams. College pitchers also averaged more strike outs per nine innings pitched, averaging 6.08 compared to the 5.64 by the high school side. College pitchers led as well in walks per innings pitched allowing 3.46 in comparison to the high schools 3.48.

Hitters from high school and college also showed similar results in the statistical categories that were measured. The college hitter's batting average of .261 was slightly ahead of the .260 mean average of the group of high school hitters. The on base percentage category was

also on average higher for college batters with a percentage of .326, in comparison to the .317 of the high school batters. College hitters were also more productive when it came to driving in runs, average an RBI once every 9.00 at bats compared to the 9.68 at bats in took for the comparable high school hitters. High school hitters lead the collegiate when it came to AB/HR hitting a home run once every 51.05 at bats compared to the college hitters one every 63.95 at bats. Worth noting when it came to this particular statistic one high school player failed to hit any home runs during his rookie season. As a result this player was removed from the group when the statistic was tabulated.

Other categories that were tabulated for both hitters and pitchers included; games played during the rookie season, at bats during the season, total inning pitched during rookie season, and the total number of days that the players spent in the minor leagues prior to completing their rookie season in the major leagues. These averaged results can be seen in table A3 and A4.

The statistical analysis results of the rookie hitter category will be discussed first. When the Omnibus tests of model coefficients were applied to the rookie hitters a significance level of .587 resulted showing a lack of predictive value in the present model. A Nagelkerge r square model resulted in a figure of .139 or only a 13.9% ability to explain the high school versus college path to the major leagues. Rookie hitting statistics showed a 57.7% predictive ability before the statistical categories were applied, after the application of the statistics high school versus college showed a predictive ability of 61.5%. Though still not statistically significant, there was a resulting increase of 3.7% in the predictive ability of the study after these particular statistics were introduced. Statistical significance did result when it came to hitters and their time spent in the minor leagues. The Pearson correlation resulted in findings of, $r = -.618$, p (two tailed) $< .01$, showing a negative correlation between time spent in the minor leagues and college

participation. As a result a correlation between less time spent in the minors for collegiate pitchers and more time spent for the high school only athletes presented and confirmed the predictive ability of the statistic. Complete data results for hitters can be seen in appendix C1.

For pitchers the Omnibus tests of model coefficients showed a significance level of .003 showing some significance in the predictive value of the model. The Nagelkerke r square model resulted in a value of .741 showing the models ability to explain 74.1% of the high school and college paths. The Hosmer and Lemeshow test showed a significance level of .781 showing good predictive abilities of the model. For the pitchers the original predictive model of the study was 50% before the application of the statistics. After the application of the statistics the resulting predictive ability of the model rose to 81.8% and overall increase of 31.8%. Though no individual baseball statistic was significant on its own, as a collective group of statistics they showed to have good significance when it comes to predictive ability. When it came to time spent in the minor leagues there was significance between time spent in the minors and their career path. A Pearson correlation showed, $r = -.492$, p (two tailed) $< .05$. Both of these models showed that spending more times in the minor leagues is negatively correlated with college attendance, resulting in a significant correlation between days spent in the minor leagues and their participation in either college or high school baseball only. Full statistical data results for pitchers can be seen in appendix C2.

Discussion

The results of this study showed that there was not a clear difference between the impact of high school only players and college players in their rookie year production. Statistics and analysis showed that there were no clear predictive abilities for hitters or pitchers. Though for pitchers some of their statistics were close to gaining some significance in their predictive value,

such as winning percentage, but overall not enough to make a clear definitive statement on their impact and predictive abilities. Statistical analysis did show that there is a relationship between the path of a player based on their time spent in the minor leagues.

The result of this study helped to reinforce the role of minor league sports and its ability to prepare players to play professional baseball at the highest level. Though some people may be on the side of college and the experience it has to offer, and others may agree with players leaving right of high school to turn professional the results showed that players are essentially equally prepared when coming out of the minor leagues. The findings helped to reinforce elements of the literature review including; cognitive development, the contributing factors to player performance, and the overall role of minor league sports. The fact that the two groups were so equally productive when they arrived in the major leagues shows that in either case the minor leagues is sufficiently preparing player's if they either spent significant time out of high school or a shorter time for the college players. These results show that athletes are developing equally in the careers and on and off the field and as a result are contributing equally to their teams at the major league level.

Though this study encompassed and found what it set out to do, there were several limitations that presented themselves throughout the study. One example being that this study only encompassed one, three year period of rookies. To further validate the findings it would be necessary to run the same statistics with multiple groups of players from different time periods. Also for this study only the American league rookies were studied, if the national league rookies had been included it could have affected the results of the study. Another limitation that was present is the fact that the defensive ability of players was not taken into account. Since the only statistical category for defense is errors, which is really not a very accurate assessment of a

player's defensive ability, defense was left out of the study for its lack of measurability. A limitation presented itself in the amount of statistics and what statistics were looked at in this study. Due to limitations this study used the basic, historically relevant baseball statistics. If more statistics were looked at or possibly if new sabermetric statistics were introduced to the study it would be hypothesized that the study would only continue to reach closer to a significant correlation between the two sides. As the statistics were introduced into this study it became more accurate, with the predictive capacity of the model increasing 3.7% for hitters and 31.8% for pitchers. It would only make sense that if the number and scope of statistics were increased the predictive capacities would do the same.

One piece of significant data that was present for both the hitters and pitchers studied was the difference in amount of time spent in the minor leagues. As the results showed, there was significance in the data collected when it came to predicting a player's path based on time spent in the minor leagues. College hitters averaged 391 days spent in the minor leagues before their promotion to the majors. That is compared to the 689 days spent in the minors by high school hitters. Some executives may be swayed by the younger high school player when it comes down to a decision between them or the collegiate hitter. However when you average out the time spent in the minor leagues developing the arrival age to the major leagues is not all that different. If you take into account the fact that the minor league season runs from roughly the beginning of April to the end of August that is about five months of playing time. If you average thirty days per month for five months that equates to 150 days of playing time per season. For collegiate hitters, when you divide that into their average days spent in the minors you get on average a player who spends 2.6 seasons in the minor leagues. This is compared to the high school hitter who on average will spend 4.6 seasons in the minor leagues. Similar results were seen when

college and high school pitchers time spent in the minors was looked at. High school pitchers on average spent 476 days in the minor leagues compared to the 287 by collegiate pitchers. When the number of seasons are averaged out high school pitchers on average spent 3.2 seasons in the minors while collegiate pitchers spent 1.9 seasons in the minor leagues. Since college players have to stay at school for three seasons there is really only a one year difference between college and high school hitter's arrival in the major leagues and less than two years for college pitchers. This could be interpreted a couple different ways depending on the organization philosophy of the team. If a team tended to lean toward the high school player because of the age factor maybe would take a step back and reconsider if a year to a year and a half in age difference is really worth taking one player over another. Or if one organization tended to stay away from the high school players because of the extra time they have to spend in the minor leagues perhaps they would reconsider because though they have to wait a longer time to see them make it to the majors, in the end they are still younger than the comparable collegiate when they arrive in the big leagues.

Though there was not a clear difference between success for high school and college players these finding would serve useful for teams that may have thought differently and tend to select one type over the other when it comes to the draft. If a front office saw the results of this study, perhaps next time it comes down to two players they won't simply take a player out of high school for example and take the player who really fits their system and philosophy the best.

These finding would also be very beneficial to the athlete themselves when it comes to their decision to leave high school for minor league ball or accept their scholarship to a college baseball program. These results could give them a peace of mind when it comes to making their decision. Since the data shows that the range between high school and college players making it

to the majors is just roughly a year difference for position players and about a year and a half for pitchers they can make the decision that's best for them without worrying solely about baseball. Not every high school age player is ready to live on their own and go through the daily grind of the minor leagues. The data would suggest that if they are more comfortable with the college route then it will really only delay their arrival to the majors a year to a year and a half. Some players may be ready to make the jump into adulthood and go right to the minors and this will give them a slight advantage when it comes to arrival in the majors, but for those who choose college it can give them the chance to develop both cognitively and physically without the pressures of professional baseball.

Conclusion

Though there was not a large discrepancy between the final mean statistics for the dependent variable for both pitchers and hitters there were still meaningful results. Overall the study did answer the question of how does rookie success relate to previous baseball experience? Though there was not a definitive result to one side or the other for both categories this is still a significant result. The fact that there was no strong difference in production for either hitters or pitchers shows that both sides no matter the path are equally prepared when reaching the major league level.

As shown by the results we can conclude that either path is equally effective in preparing players for the majors. We can see that playing in college for three years and playing in the minors for a short period of time is statistically similar to going straight from high school to the minors and spending a longer time in the minor leagues. Theoretically this would validate either paths ability to prepare players both on and off the field. It also reinforces the role of the player development system in Major League Baseball. No matter what path these players take to

professional baseball the MLB has put in place a system that equally and effectively prepares each player to be successful rookies in the major leagues. Strength of this study lies in its repeatability and room for expansion. Though the results lacked statistical significance they did show as more baseball statistics were added into the study into continued to gain more and more significance. If someone were to choose to expand the scope of the target groups and statistics looked at, perhaps significant predictors can be achieved. Overall this study has provided a strong foundation for future research on player development to be based upon.

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Appendix

Table A1

Hitters	AVG.	OBP	AB/HR	AB/RBI
College	.261	.326	63.95	9.0
High School	.260	.317	51.05	9.68

Table A2

Pitchers	ERA	W%	BB/9	SO/9	WHIP
College	4.86	.543	3.46	6.08	1.45
High School	4.36	.468	3.48	5.64	1.43

Table A3

Hitters	Total Games Played	At Bats	Days in Minors
College	105.6	364.27	391.47
High School	108.0	388.18	688.82

Table A4

Pitchers	Total Games Played	Innings Pitched	Days in Minors
College	27.18	138.02	286.73
High School	26.64	151.36	475.56

Appendix B

Original Data Sets

Hitters

Player	College/HS	Season	Days In Minors	Games	AB	AVG.	OBP	HR	RBI	AB/HR	AB/RBI
GB	College	2009	69	103	378	0.270	0.347	14	63	27	6
CG	College	2009	517	107	375	0.261	0.324	2	31	187.5	12.1
NR	College	2009	569	104	358	0.279	0.365	15	45	23.9	8
MW	College	2009	192	96	354	0.288	0.340	9	43	39.3	8.2
MM	College	2009	783	127	341	0.243	0.333	3	31	113.7	11
AJ	HS	2010	642	151	618	0.293	0.345	4	41	154.5	15.1
BB	College	2010	522	133	464	0.256	0.320	14	67	33.1	6.9
AA	College	2010	186	104	294	0.228	0.316	7	31	42	9.5
MS	HS	2010	640	100	289	0.211	0.295	10	33	28.9	8.8
JS	College	2010	166	100	348	0.218	0.307	13	48	26.8	7.3
JJ	HS	2010	784	109	339	0.263	0.372	5	44	67.8	7.7
RB	HS	2010	730	113	301	0.256	0.307	8	45	37.6	6.7
DV	College	2010	522	85	299	0.311	0.351	7	40	42.7	7.5
MB	HS	2010	760	72	297	0.246	0.296	3	22	99	13.5
JD	College	2010	550	88	296	0.253	0.312	4	24	74	12.3
MT	HS	2011	813	149	539	0.254	0.291	29	87	18.6	6.2
EH	HS	2011	319	128	523	0.293	0.334	19	78	27.5	6.7
MM	HS	2011	500	89	338	0.263	0.309	5	30	67.6	11.3
BR	HS	2011	521	117	450	0.267	0.310	0	30	0	15
TP	HS	2011	885	81	286	0.238	0.305	8	31	35.8	9.2
JA	College	2011	509	129	443	0.219	0.282	23	78	19.3	5.7
ET	College	2011	378	95	362	0.262	0.313	12	37	30.2	9.8
BM	College	2011	361	126	413	0.245	0.287	10	41	41.3	10.1
JW	College	2011	337	97	406	0.303	0.340	2	36	203	11.3
DA	College	2011	211	90	333	0.273	0.348	6	36	55.5	9.3
MC	HS	2011	983	79	290	0.276	0.326	12	46	24.2	6.3

Pitchers

Player	College /HS	Season	Days In Minors	Games	IP	ERA	W%	W	L	BB	BB/9	SO	SO/9	WHIP
JN	College	2009	334	31	180.2	3.94	0.684	13	6	59	2.94	125	6.23	1.35
DP	College	2009	121	23	128.1	4.42	0.588	10	7	54	3.79	102	7.15	1.35
TC	HS	2009	229	32	178.2	4.63	0.435	10	13	72	3.63	90	4.53	1.44
BA	HS	2009	275	30	175.1	4.06	0.500	11	11	45	2.31	150	7.70	1.28
RR	College	2009	400	29	178.0	4.30	0.591	13	9	79	3.99	141	7.13	1.52
SR	College	2009	197	27	138.2	5.52	0.421	8	11	59	3.83	117	7.59	1.49
RP	HS	2009	144	31	170.2	3.96	0.609	14	9	52	2.74	89	4.69	1.34
DH	College	2009	208	33	138.1	6.12	0.381	8	13	47	3.06	107	6.96	1.50
TH	College	2009	246	19	112.0	4.10	0.600	9	6	33	2.65	64	5.14	1.30
DH	College	2009	247	23	128.1	5.61	0.579	11	8	41	2.88	65	4.56	1.56
JB	College	2009	366	24	119.2	6.54	0.333	6	12	44	3.31	66	4.96	1.74
BB	HS	2009	485	19	123.1	3.43	0.583	7	5	32	2.34	65	4.74	1.28
DH	HS	2009	561	20	101.1	5.42	0.286	4	10	46	4.09	68	6.04	1.62
MP	College	2009	630	40	121.1	3.93	0.846	11	2	55	4.08	69	5.12	1.32
BM	College	2010	100	32	175.2	4.30	0.455	10	12	63	3.23	143	7.33	1.34
JA	College	2010	305	18	100.1	4.66	0.500	6	6	48	4.31	52	4.66	1.53
WD	HS	2010	685	29	168.0	4.07	0.545	12	10	62	3.32	113	6.05	1.35
MT	HS	2010	801	28	159.1	4.41	0.435	10	13	69	3.90	88	4.97	1.49
JH	HS	2011	601	29	189.0	2.95	0.565	13	10	72	3.43	117	5.57	1.15
ZB	HS	2011	562	28	154.1	4.61	0.500	11	11	62	3.62	97	5.66	1.45
TC	HS	2011	450	27	142.0	4.75	0.353	6	11	71	4.50	74	4.69	1.67
DD	HS	2011	438	20	105.1	5.64	0.333	4	8	54	4.36	87	7.43	1.61

Appendix C1

Hitters

Logistic Regression

Classification Table					
Observed		Predicted			
		HS/College		Percentage	
		HS	College	Correct	
Step	HS/College	HS	0	11	.0
p 0		College	0	15	100.0
Overall Percentage					57.7

Omnibus Tests of Model Coefficients				
		Chi-square	df	Sig.
Step	Step	2.829	4	.587
1	Block	2.829	4	.587
	Model	2.829	4	.587

Classification Table					
Observed		Predicted			
		HS/College		Percentage	
		HS	College	Correct	
Step	HS/College	HS	4	7	36.4
1		Colleg e	3	12	80.0
Overall Percentage					61.5

Hitters		
Variable	B	Sig.
AVG	-18.748	.435
OBP	23.472	.386
ABHR	.012	.332
ABRBI	-.209	.340
Constant	-1.114	.866
R ²		.139

Hosmer and Lemeshow Test			
Step	Chi-square	df	Sig.
1	13.951	7	.052

Appendix C2

Pitchers

Logistic Regression

Classification Table					
Observed		Predicted			
		HS/College		Percentage	
		HS	College	Correct	
Step	HS/College	HS	0	11	.0
0		College	0	11	100.0
Overall Percentage					50.0

Omnibus Tests of Model Coefficients				
		Chi-square	df	Sig.
Ste	Step	17.845	5	.003
p 1	Block	17.845	5	.003
	Model	17.845	5	.003

Hosmer and Lemeshow Test			
Step	Chi-square	df	Sig.
1	4.779	8	.781

Classification Table					
Observed		Predicted			
		HS College		Percentage	
		HS	College	Correct	
Step	HS	HS	9	2	81.8
1		College	2	9	81.8
Overall Percentage					81.8

Variables in the Equation		
Variable	B	Sig.
ERA	7.275	.169
WPercentage	41.111	.064
BB9	1.766	.461
SO9	.550	.468
WHIP	-17.462	.502
Constant	-38.168	.085
R2		.741