Baseball Career Length in the Twentieth-Century:
The Effects of Age, Performance, and Era*

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Abstract

Although baseball is considered "the" American pastime, little is known about the career prospects of the individuals who play the game. This study fills that void by examining the careers of baseball players over the last century. Between 1902 and 1985, 5,767 position players started their careers and played 28,790 person years of Major League baseball. The average position player can expect to play just five years; over one in four position players will have only a single-year career, and at every point of a player's career, the chance of exiting is at least 11%. Position players who start younger, perform better, and begin their career in more recent decades all have longer and more stable careers; nevertheless, baseball careers are not compressed versions of normal careers, but are substantially skewed toward early exit.

Although baseball has long been considered "the" American pastime, little is known about the career prospects of the individuals who play the game. This is surprising given the detailed historical data on baseball players and the large number of working life tables for various occupations. We use life tables to assess three factors – period/era played, player's age at the start of their career, and performance – that influence the career length of more than 5,000 Major League baseball position players over the last century.

An understanding of the factors affecting career longevity and performance within the workforce is useful in modeling the effects of demographic changes on various labor force outcomes. The ability to become and remain employed and succeed in the labor force confers economic, social, physical, and psychological rewards. For example, compared to individuals who are not in the labor force, employed individuals with high-level occupational status generally live longer and healthier lives (Monson 1986; Sorlie & Rogot 1990; Preston & Taubman 1994; Rosenberg et al. 1993; Rogers et al. 2000). Individuals enter and exit the labor force and undergo various transitions throughout their careers. There is a long and rich demographic history of examining working life tables at the national level by sex and race, and among specific occupations and industries, including laborers in the construction industry, salaried workers in the automobile industry, and priests and other religious officials within the church (Siegel 2002). The examination of factors that influence careers – including baseball – will therefore inform broader sociological, economic, and demographic concerns.

Several characteristics distinguish professional sports careers from most other careers. Notably, players know (but do not necessarily accept) that the role is temporary, career length is strongly tied to performance, exit is often involuntary, and the elite status conferred by the role is difficult to achieve after leaving the role (Drahota & Eitzen 1998). The odds of becoming a professional athlete are low, and even after a rigorous selection process, a Major League career

may be brief (Coakley 1994; Figler 1981; Guttmann 1988). Just 2 of 10,000 males aged 15 to 39 reach professional athlete status (Leonard 1996). The odds are better for high school athletes: the odds of a high school baseball player entering the Major Leagues are .002, roughly the same for football players and two times better than for basketball players (Leonard 1996). Whereas a career in professional baseball is prestigious in itself, some players garner more prestige than others. Therefore, an examination of the factors that affect these players will also provide information regarding more routine careers.

It is difficult to determine accurate baseball career lengths because many researchers have calculated simple averages, based their estimates on selected years, selected players, or selected subsamples of all baseball players. Jiobu (1988) found the median career length of baseball players to be 11.8 years for blacks, and 10.0 years for both whites and Latinos. Schulz et al. (1994) found that about 55% of all players who played in 1965 had ten-year careers. These astonishingly high averages are due partly to the fact that Jiobu (1988) included only individuals who played in at least 50 games, and Schulz et al. (1994) did not adjust for the increased number of opportunities created in the expansions of 1961, 1962, 1969, and to some extent 1977. Thus, these estimates may inflate the actual years of expected play.

Baseball careers are not normally distributed. Instead, the careers are skewed, with many players experiencing one or two years of play, and a rarefied few enjoying 20 or more years of play. Rosenberg (1980) used life tables to examine two five-year cohorts of baseball players, one from the early 1950s and one from the early 1960s. He found that there was a significant difference between median and mean career length, showing that the few long careers skewed the numerous shorter careers. In comparing the two decades, he found a significant increase in the percentage of players playing more than four years.

Career longevity is inextricably linked to age and job performance. The effect of age on performance follows a general trend: productivity tends to increase at a rapid rate until a peak age of productivity is reached, after which productivity diminishes gradually (Lehman 1953; Simonton 1990; Schulz & Curnow 1988). The age of peak performance varies, and it depends on the career choice and the field of creative output (Lehman 1953). The age of peak performance in professional baseball tends to be earlier than the average career, which is understandable given the physical demands and coordination required to play professional sports (Schulz et al. 1994). Most important to this study is the comprehension of how productivity and age can affect career longevity.

For different ages there are different performance expectations, and failure to meet these expectations will likely end a career (Faulkner 1975; McPhearson 1980). In the minor leagues, it is easier to determine the future of baseball players at performance extremes: exceptional players are promoted to higher leagues and subpar players are dropped from the team. Players near the margins may linger at the same level, too good to let go but not good enough to promote (Spurr & Barber 1994). Schulz et al. (1994) analyzed 388 baseball players active in 1965 "to determine the age of peak performance for skills required to play baseball, to derive age-performance curves for athletic productivity, and to assess the magnitude of individual differences among elite and less able players" (p. 274). They examined starting age, exit age, and ability relative to career length. They found that the age of peak performance was between ages 27 and 30 and that star players peaked earlier and maintained their peak performance longer. But their sample was small and biased: they included players with career lengths of over ten years and selected players from a single year, 1965, partly on the grounds that "major changes in the game were unlikely to complicate the interpretation of performance data" (p. 275). We argue the opposite: careers are likely to be longer for players who played in 1965 because of the effects of league

expansion throughout the decade. Furthermore, it is important to examine different eras to determine the period effects on performance indicators.

Several researchers have examined withdrawal rates among baseball players. Rosenberg (1980) found the 1950s cohort first-year withdrawal rate (26.7%) to be nine percentage points greater than the 1960s cohort withdrawal rate (17.6%). Whereas the exit rates are generally higher in the 1950s, both cohorts show a similar pattern of high exit rates in year one, followed by a steady decrease to a nadir around 10% in year five, and then steady increases to year 10, with an exponential increase thereafter. Although this study provides valuable information, the size of the cohorts is small (each under 650). Moreover, Rosenberg proffers no explanations for the differences between the decades, though it seems obvious that the league expansion from 16 to 24 teams during the 1960s diluted the labor pool and likely extended careers in the later cohort.

Ballplayers leave the game for a wide variety of reasons, including retirement, other career opportunities, injuries, drug abuse, gambling problems, and death. Many players wish to continue play because they love the game; some, because of low levels of education and little job experience, may lack alternate career choices (Rosenberg 1980). Because of the required time, energy, and focus, it is nearly impossible to develop a career outside of sports while actively playing ball (McPhearson 1980). Historically, salaries were insufficient to afford players comfortable early retirement. Rosenberg (1980) foresaw the increase in salaries and predicted that this increase would lead to better post-baseball adjustments and more athletes who "quit while they are ahead." By extension, this implies a shortening of careers for players at the higher end of the career length spectrum, and also suggests that more recent decades would show a trend toward shorter careers.

Many professional athletes retire because of injuries. Overfield (1989) established that eight twentieth-century players had their careers significantly altered after being struck by a pitch. One study of 511 retired baseball players demonstrated that 45.2% indicated forced retirement (Lerch 1979). This number seems surprisingly low, considering the numerous anecdotal accounts in the baseball literature and other role exit studies that show leaving the status of professional athlete as undesirable and difficult. For instance, following a 24-year career, Pete Rose stated, "I'd walk through hell in a gasoline suit to keep playing baseball" (Lahman 1999: 2505).

And there are more unfortunate reasons why some players' careers are cut short. After extensive archival research on players from 1900 through 1992, Gutman (1992) cites 20 sex scandals, numerous gambling malefactions, 31 players banned for life, 63 players who were "named, arrested, treated or have admitted to having used cocaine" (p. 109), and numerous drinking problems. One player died of on-field injuries, eighteen died within 12 months of having played, four active players had been murdered, and five had committed suicide.

Of course, some Major League baseball players fare quite well upon retirement. Talamani (1989) found that after retirement from Major League baseball, 74% of players held "high prestige" jobs, including some in business, finance, and politics, and that 42% still had jobs associated with the sports world. This is a clearly positive depiction of life after baseball, but included only players whose address was known and who were employed, which likely biases Talamani's (1989) study. According to a recent report, only 42 major league baseball players, or 5.6% of the league, in 2004 had earned college degrees (Shea 2004).

Baseball has witnessed both expansions and contractions during the last century, changes that have affected players' career prospects. For this study, we have identified five periods. The first is the deadball era (1902-1920), when baseball was beginning to become a popular fan

sport. There were 16 teams in the American and National Leagues combined, plus the Federal League, which existed for two years, 1914 and 1915, and consisted of eight teams that competed against the National and American leagues. World War I may have affected players starting in this era. The deadball era is distinguished from the next era by its comparative paucity of home runs hit, owing largely to the character of the ball itself. The second era is the golden era (1921-1937), the time when Babe Ruth and Lou Gehrig played most of their careers. There were still only 16 teams in the league, but the ball was made "livelier" so that home runs increased, and with them, fan attendance. Baseball was extremely stable in terms of rules, teams, and image.

The third era is the war/postwar era (1938-1955), again with just 16 teams in Major League baseball. Players who started in this era were likely to be affected by World War II. Many players were drafted into military service; their careers were shortened or ended, and others were given an opportunity to play. The Korean War created a similar but smaller effect. Hall of fame member Ted Williams exemplifies this: he lost all or part of five seasons when he enlisted in both World War II and the Korean War. The fourth era is the expansion era (1956-1970). Players who started in this era had their careers significantly influenced by the expansion of baseball in 1961 (two teams), 1962 (two teams), and 1969 (four teams), which increased the number of jobs for players by 50%. Baseball became more integrated (though Jackie Robinson had broken the color barrier in 1947), and television further increased the popularity of the sport.

The fifth era is referred to here as the free agent era (1971-1985). It would be more accurate to call this period the infancy of free agency, but the true free agent era of today is not included because reasonably complete statistics are not available. Following a movement by the players' union in 1974, the players were permitted to negotiate moves between teams, a change

that may have allowed some of them to extend their careers. Also during this era, the league expanded once more by adding two teams in 1977; furthermore, some of the players who started in this era may have had their careers lengthened by the expansion to two more teams in 1993.

Hypotheses

Starting age, player performance, and era have all affected baseball careers. Yet, these factors are not fully addressed in the literature. Drawing from the previous research, we have formulated three hypotheses about the career patterns of position players:

*Hypothesis 1***:** Age will have an inverse effect on career patterns: compared to players who start at older ages, players who start at younger ages will enjoy longer careers. Young major league players generally have demonstrated promise early on; may have faster reaction time, speed, and muscle mass; may be less prone to injury; and if injured, may recover more quickly (see Shulz et al. 1994).

Hypothesis 2: Performance will have an effect on career patterns: players on the extremes of first-year performance will have vastly different career characteristics. The first year is critical in the evaluation of a player's talent and ability to help the team, so the worst players will have exceptionally brief careers and the best players will enjoy very long careers. This is consistent with Spurr and Barber's (1994) examination of the minor leagues and Rosenberg's (1980) examination of cohorts in the 1950s and 1960s.

*Hypothesis 3***:** Period effects will influence career patterns: eras with fewer teams will have more players who will witness shorter careers than eras with league expansion.

Data and Methods

Typical studies of baseball players analyze cross-sectional data or examine a small cohort from one era. Such data sets may obscure trends that evolve over longer periods and among larger cohorts. Moreover, many analytical techniques are not particularly well suited to determining the length of a player's career. We use life table analyses to determine players' careers, an especially suitable technique to examine our results. Furthermore, our data provide a more comprehensive analysis of trends over time by including every player who started his career between 1902 and 1985.

The data for this study were created from the bibliographic listings of every Major League baseball player compiled in *Total Baseball* (Thorn et al. 1999a), which is more current and complete than similar sources, such as the *Baseball Encyclopedia*. Statistics on baseball players have been well maintained since the inception of the game in the nineteenth century, and the records in *Total Baseball* are the product of over forty years of in-depth historical research. *Total Baseball* includes a wealth of information, including the year a player's career started, the year his career ended, total years/seasons played, year of birth, year of death, career total player rating (TPR), and the first-year TPR. From this information, we calculated starting age, career span, and age at the end of a career for position players. We excluded pitchers because they occupy a unique position and because they are especially prone to injury (Okrent 1999).

Baseball statistics remain remarkably stable. For instance, in 1876, the number of official fielding statistics recorded was six; today it is still six, except for catchers, who also have the category of passed balls (Thorn et al. 1999b). Nevertheless, some information is not reported, is misrecorded, or is inconsistent because different statistical measures are used at different times. For instance, at various times, sacrifices have been counted as hits or at bats, or have not been counted at all; today, they are counted as a separate category. There was also a time when a

walk was counted as a hit and batters routinely batted over .400 (Thorn et al. 1999b). Further bedeviling comparisons are the changes made to the game. For example, a "livelier" ball was introduced in 1920, and the pitcher's mound was lowered in 1969, both of which affected statistics.

To minimize any problems with longitudinal comparisons, we limited our data set to the years 1902-1985, thus avoiding the late-nineteenth century period when numerous "Major Leagues" existed, the number of teams fluctuated, and each league had different rules and different record keeping, complicating comparisons across even one year. Also, we used total player rating (TPR) as the only performance measure. This statistic measures a player's performance relative to other players at the same position, in the same year, and is stabilized across years by a runs per win factor for each year. This avoids longitudinal problems; it has the further advantage of comparing each player to other players in the same position, just as a team owner would in deciding whether to keep or cut the player, so it is clearly relevant to career length.

Only position players who started their careers between 1902 and 1985 are included in this study. The lower limit was imposed to ensure accurate statistics and comparable information, whereas the upper limit was chosen so that very few players in the study would have indeterminate career lengths. For instance, approximately 97% of players who started in 1985 had finished their careers by 1998. Thus, very little career information has to be extrapolated. In this study, all references to year refer to starting year. Thus, an era defined as 1902 to 1920 refers to all players who started their careers during this time.

Career length reflects the number of years when a player played in at least one game. Even a player who simply pinch-hits once is considered to have played a year, but a player could be on a team roster for a significant portion of a year and not be counted if he did not appear in a

game. All years played reflect only years played in Major League baseball; no data from the minor leagues are included. The Federal League, however, is included, as it is considered a Major League by *Total Baseball* and the National Baseball Hall of Fame (Thorn et al. 1999a). It should also be noted that years are measured as integers rather than fractions.

Total player rating (TPR) is a complex statistic (see Thorn et al. 1999 for a detailed description). While controlling for position, year, and variations across years, TPR weighs a player's hitting, baserunning, and fielding to determine a score that generally ranges from -6.0 to 8.0 for a single year. A rating of zero is considered average, while a positive rating is above average and a negative rating is below average. Career TPR is the sum of the TPRs from each year played. This is a reflection of the player's career rating, but not a true career TPR, because those variables are relative to each year. Therefore, a career's worth of statistics cannot be used to calculate a career TPR. TPR is not adjusted to the number of games played, which means that a player who plays in a very small number of games could have an identical rating to that of a player who plays in every game. But this method may be the best way to compare players who have played differing numbers of years. Overall, TPR is an excellent overall predictor of player performance.

We categorize player rating as extremely positive (greater than 0.5), positive (greater than zero but less than 0.5), negative (greater than -0.5 but less than or equal to zero), or extremely negative (less than or equal to -0.5). Because TPR lacks an intuitive meaning, the categories were based on the distributions to have relatively few players in the extreme categories (893 and 339 respectively) and a majority in the middle categories (3332 and 1514, respectively, with the negative category inflated because of the inclusion of zeros). The categories are defined by the overall distribution of player ratings and the ease of natural cut-points**.** The inclusion of zero in the negative category skews this category toward extremely short careers, because individuals

who play in few games are unlikely to produce enough statistics to generate either positive or negative ratings.

Life Table Methodology

We employ life table analysis to show the average number of years a player can expect to play, and the probability at any given point of ending a career (see Shyrock and Siegal 1976 for a useful review). "The life table shows the proportion of a population or sample who survive at specific durations after exposure to an event risk" (Smith 1992: 73). Life tables have been used to study a variety of issues including working, married, and disability-free lives (Pollard et al. 1990), and thus are well-suited to depict the careers of baseball players.

While we calculate l_x (number of players at beginning of the interval), d_x (number of players exiting during the interval), q_x (proportion exiting during the interval: d_x / l_x), L_x (the average player years in the given interval: $(l_{x1}+l_{x2},)/2$), T_x (player years in current and subsequent intervals: $l_{x1} + l_{x2}+ l_{xn}$), and e_x (average remaining career years: T_x / l_x) life table values, we focus on e_x and q_x. The e_0 is the career expectancy at the beginning of the career year interval. Thus, upon entry into Major League baseball, e_0 indicates the average length of a player's total career. The q_x is the proportion of players who play in year x but whose careers do not continue on to the next , or career year x + 1. This is the exit rate: the probability that the player's career will end during that career year. The life tables calculated in this study are complete (single year) rather than abridged (5-year) life tables. This allows the few higher cases to exert greater influence on the data than if they were aggregated into a category. Even though the complete range of career years may not be presented in various tables, the numbers are derived from a complete life table.

Results

Table 1 shows the complete life table for all position players who began their careers between 1902 and 1985. The first column (l_x) shows the number of baseball players who began a year of play. Between 1902 and 1985, 5,767 position players began their first year of professional baseball. Within the first year, 1,588 players (d_0), or 28% (q_0), left baseball, leaving 4,179 to continue play in their second year. Over the course of the twentieth century, professional baseball players played for approximately 28,790 career years (T_0). On average, a rookie can expect to play professional ball for 5 years (e_0).

Table 1 about here

The first year of play is quite competitive, with more than one-quarter of the players exiting. Fewer than half of all rookies stay in the game long enough to see their fourth year of play. And only about 1% of players have careers of 20 or more years. Further, only one player in the twentieth century, Eddie Collins, stayed in the game long enough to see his twenty-fifth year of play.

After the first year, the probability of ending a career (q_x) steadily decreases for the next three career years, then levels off at 11 to 13%for career years 4 through 8. This is the most stable point in a player's career. Career years 9 through 19 see a slow and steady rise in the probability of a player ending a career, and for every year after year 16, there is at least a 32% chance of ending a career in that year.

The career expectancy, e_0, is 5.0 years for all players who reach the Major Leagues. The high dropout rate in the first two years leads to an increase in career expectancy in career years two and three. Year three has the highest career expectancy at 5.9 years: a position player who makes it to his third year can expect to play a total of 8.9 years in Major League baseball. The e_x slowly decreases for every subsequent career year after year three until year eight, after which

the decrease in career expectancy becomes more rapid. Yet a position player who makes it to his fourteenth season can still expect to play more than three additional seasons. Fewer than 10% of players make it to career year 14.

Panel A in Table 2 examines the effects of starting age on the probability of ending a career, q_x, for different starting ages. The probability of ending a career after one year is 19% for players starting at age 20, and steadily increases from 17% for players starting at age 21 to 38% for players starting at age 28. This trend continues in subsequent career years, with those starting at age 23 and under having occasional career years where the probability of ending a career is less than 10%, a rate not found in any career year for players starting at ages 24 and above. For example, of all players who started at age 22 and made it to the fourth year of play, only 8% will not make it to the fifth year of play; in comparison of all players who started at age 25 and made it the fourth year of play, 18% will not make it to the fifth year of play. This small example illustrates the importance of starting a career early, because the 25 year old cohort are still under 30 at the end of their 4^{th} year, have proven themselves in baseball for four years, but still have an exit rate that is double that of their counterparts who started three years younger.

Table 2 about here

Panel B shows career expectancy (e_x) for different starting ages. Upon entry into Major League baseball, those players who start at age 20 can expect to play 8.1 years. As starting age increases, career expectancy decreases, down to 2.6 years for players who begin at age 28. This confirms the first hypothesis, that players beginning at younger ages will enjoy longer careers. On average, a year waited in starting a career will cost a player an additional four-fifths of a year in career length. This statement is generally true for starting ages from 20 to 28, but the difference is not uniform; between ages 21 and 22, a one-year delay in starting age will cost a

player 1.3 career years. Starting a career at age 23 or earlier leads to above-average career length; starting a career at age 24 or older leads to below-average career length.

Confirming the second hypothesis, players with extremely positive ratings have far lower probabilities of ending their career than those in other categories (see Table 3, Panel A). For every career year one through seven, the risk of leaving baseball is under 10%, a level of security never reached for all position players taken together. Compared to all position players, the exit rate for first-year players with extremely positive ratings is over 20 percentage points better. Not nearly as dramatic are the differences for players with positive and extremely negative ratings. First-year players with positive ratings have only a slight advantage over those in the extremely negative category, generally a .02 to .05 advantage in all career years. The highest exit rates are found among players with negative ratings, probably because that category includes players whose "average" ratings of 0 really reflect extremely short "careers" of only a few games.

Table 3 about here

Accordingly, players with extremely positive first-year ratings can expect to play an average of 8.5 years, those with positive ratings can expect to play 5.9 years, and those with extremely negative ratings, 5.2 years (Panel B). This lower survival quickly depletes the proportion of individuals able to play in subsequent years. For instance, Figure 1, which depicts the proportion surviving at various career years, shows that only 50% of the players with extremely negative ratings are left by career year four, whereas a similar proportion of players with extremely positive ratings will continue to career year nine. Not surprisingly, players with extremely positive ratings can expect to stay in the game much longer; those with extremely negative ratings can expect quick exits, often within the first few years.

Figure 1 about here

The period effects predicted by the third hypothesis are shown in Table 4 and Figure 2. The exit rates in Panel A clearly show a trend toward more secure careers over time. The first career year exit rate decreases from a huge 0.40 in the deadball era to only 0.14 in the free agent era. The deadball era's exit rate is dreadfully high in career year one because the Federal League folded after only two years, forcing its players out of baseball. But even if we examine career years three and later, it still is apparent that players starting in the deadball era had shorter careers than those starting later.

Table 4 and Figure 2 about here

Panel A shows a significant breakpoint between the war/postwar and expansion eras (see also Figure 2). World War II shortened careers by recruiting players into the service, while giving others brief careers as temporary replacements for ballplayers who left for the war but then returned. By creating more jobs, the expansion era lowered selectivity and extended the careers of average players. Panel B shows the same facts in the form of career expectancy. Again the biggest gap is seen between the war/postwar (4.5 years) and expansion (6.8 years) eras. Examining the extremes we find that, upon entry into Major League baseball, players in the deadball era could expect to play only 3.6 years, whereas those starting in the free agency era could expect to play 6.6 years.

Conclusions

The above results provide new information about the general patterns of baseball careers as well as confirming our three hypotheses. Starting age is important, as stated in our first hypothesis. Individuals who start professional baseball at age 20 can expect to play 8 years, whereas players starting at age 28 can expect to play just 2.6 years. Shulz et al. (1994) assert that the range of maximum performance is between 25 and 31 years of age. These results suggest

that age affects career longevity. While both the starting age and the peak performance in a "normal" career may be older, it appears safe to assume that a similar window of success exists, and that maximum performance is reached by a certain age. It is likely that an individual who occupies a high status occupation at a young age possesses exceptional skills or acumen.

Our results show that in general a first-year player in Major League baseball can expect to play 5 years, but a fourth-year player can expect to play almost 6 additional years. This may seem counterintuitive: if a player ages a year, he ought to be one year closer to the end of his career. But, every additional year a young player survives proves his worth and his potential value to his team, hence the fourth year player's improved prospects.

Similar to a "normal" career, baseball players who survive the initial years of experience are likely to have longer careers. This underscores the importance of performance in the first few years of a career to a long-term career as both typical jobs and professional baseball players are subject to specific performance criteria and are often contracted to performance reviews. Whereas a normal work career typically involves a gradual ascent followed by a slow decline, baseball careers are characterized by rapid ascent followed by rapid decline, or more accurately as an inevitably short time on a very slippery slope, thus demonstrating a compressed work career. The explanation lies in baseball's extremely high selectivity; with an exit probability of 28% in the first year and 11% or greater in every subsequent year.

In accordance with the second hypothesis, the results indicate that performance matters. Among the top 11 first-year player ratings, five are current or future Hall of Famers, including Frank Robinson, Joe DiMaggio, and Ozzie Smith. But the relationship is imperfect. For example, Mitchell Page has the highest first year player rating, but never distinguished himself in an eight-year career that began in 1977. Similarly, Larry Bowa played 16 seasons and appeared in five all-star games, but had the seventh worst first year TPR in history. Nevertheless, the

performance results support Spurr and Barber's (1994) conclusion that there exists a relationship between performance and career length. This information reveals that performance and occupational prestige and career length are related. Given that performance matters, it becomes useful to understand the relationships between performance and the various outcomes associated with occupational prestige. While difficult to measure in many work settings, it is possible that performance (which is likely a combination of abilities and motivation, regardless of selectivity) is a good indicator of various workplace outcomes.

Of course, there are most likely nonperformance factors in career length. Some players with modest performance may be able to retain their jobs because their teams or employers are unwilling to pay the additional salary to replace them, or cannot compete with other teams or employers to attract more prominent players. In some instances, the marginal gains may not be worth the additional costs. Moreover, some personality characteristics—strong charisma, an affable personality, strong name identification, an engaging and articulate manner, or veteran leadership – may counter lackluster performance and further a career. Some ballplayers may leave the sport because of personal problems, including gambling, sex scandals, drug or alcohol abuse, or death (see Gutman 1992). For instance, "Shoeless" Joe Jackson was banned for life after his thirteenth season for his alleged involvement in the infamous Black Sox Scandal, but his .382 batting average his last year clearly shows he still had some good years remaining. Donnie Moore tragically killed himself in 1989, unable to shake the tormenting memories of a homerun he gave up three years before. While these anecdotal accounts reflect a small proportion of the population of baseball players, they help illuminate the various reasons why careers end.

Following the third hypothesis, economic downturns, wars, and league reductions can shorten baseball careers. For instance, George Stone once led the American league in hits, and in a different year led the league in batting average and slugging percentage, yet managed only a

seven-year career in the deadball era. On the other hand, longer baseball careers can result from multiple factors, including league expansion and free agency, which allow a player to sell himself to anyone who is willing to pay him. For example, Alex Trevino played for six teams in the free agent era, was consistently below average for his position, and hit a total of 23 homeruns, but still managed to play 13 seasons. Additional factors – such as sports training, sports medicine, higher salaries, and lifestyle changes – may also help lengthen careers in more recent eras.

Exogenous economic and social factors contribute to career longevity. Economic downturns, and changes in the economy including job availability and occupational demands are likely to affect career paths. The number of available positions affects the career of baseball players. Therefore, this research elucidates the importance of including period effects when examining career trajectories and the occupational positions that one occupies.

Increasingly long careers support the role exit studies of Drahota & Eitzen (1998), Lerch (1979, 1984), and others who say that the ending of the career is usually involuntary; despite the higher salaries of recent years, players want to play as long as possible. Because many players resist the reality that being a Major League baseball player is a temporary role (Drahota & Eitzen 1998), education and job training should begin in the minor leagues. Additionally, training should be available after the end of the career, because after their sports careers end, athletes who enter the job market are forced to compete with people younger and better trained than themselves. Major League baseball and/or the Players Association might implement such programs. Previously, a player needed to have played five years or more to receive full benefits in the pension plan, which would cover only 43% of all position players. Recently, the players' union has done well to change the pension plan to benefit all players who play at least one game (Bevis 1991). Additionally, new research has demonstrated that exiting the labor force may have

deleterious effects on the "normal" worker (Kim & Moen 2002), and more research is needed to understand the economic, physical, and psychological strain that is placed on retiring individuals.

Beyond the highlight reels and statistics, playing baseball is a career. This study employed demographic life table techniques to illuminate the effects of starting age, performance, and period effects on the careers of position players in professional baseball. Future research could expand our results by examining other professional sports careers and by examining life expectancies of professional athletes. Overall, our results add insight into this unique career and inform subsequent workplace outcomes associated with occupational performance and career longevity.

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Table 1: Complete Career Table for Position Baseball Players, 1902-1985.

Year of play	Career length	Numbers of players at beginning of interval l_x	Number exiting during interval d_x	Proportion exiting during interval q_x	Player years in interval L_x	Player years in this and all subsequent intervals T_x	Average remaining career years e_x
1st	0-1	5767	1588	0.28	4973.0	28788.5	5.0
2nd	1-2	4179	804	0.19	3777.0	23815.5	5.7
3rd	2-3	3375	509	0.15	3120.5	20038.5	5.9
4th	3-4	2866	376	0.13	2678.0	16918.0	5.9
5th	4-5	2490	277	0.11	2351.5	14240.0	5.7
6th	5-6	2213	287	0.13	2069.5	11888.5	5.4
7th	6-7	1926	219	0.11	1816.5	9819.0	5.1
8th	7-8	1707	224	0.13	1595.0	8002.5	4.7
9th	8-9	1483	231	0.16	1367.5	6407.5	4.3
10th	9-10	1252	213	0.17	1145.5	5040.0	4.0
11th	10-11	1039	201	0.19	938.5	3894.5	3.8
12th	11-12	838	177	0.21	749.5	2956.0	3.5
13th	12-13	661	137	0.21	592.5	2206.5	3.3
14th	13-14	524	110	0.21	469.0	1614.0	3.1
15th	14-15	414	110	0.27	359.0	1145.0	2.8
16th	15-16	304	71	0.23	268.5	786.0	2.6
17th	16-17	233	75	0.32	195.5	517.5	2.2
18th	17-18	158	58	0.37	129.0	322.0	2.0
19th	18-19	100	39	0.39	80.5	193.0	1.9
20th	19-20	61	23	0.38	49.5	112.5	1.8
21st	20-21	38	12	0.32	32.0	63.0	1.7
22nd	21-22	26	14	0.54	19.0	31.0	1.2
23rd	22-23	12	7	0.58	8.5	12.0	1.0
24th	23-24	5	4	0.80	3.0	3.5	0.7
25th	24-25	1	1	1.00	0.5	0.5	0.5

Source: Derived from *Total Baseball*, 6th Edition, 1999.

Table 2: The Effects of Starting Age on the Risk of a Career Ending and on the Average Career Years Expected for Position Baseball Players, 1902-1985.

Year of Play	Career Length	Starting Ages									All Ages
		20	21	22	23	24	25	26	27	28	
A. Proportion of Careers Ending During Interval											
1st	0-1	0.19	0.17	0.22	0.21	0.23	0.30	0.33	0.37	0.38	0.28
2nd	1-2	0.10	0.11	0.15	0.16	0.15	0.23	0.29	0.34	0.34	0.19
3rd	2-3	0.05	0.09	0.11	0.15	0.16	0.17	0.19	0.25	0.27	0.15
4th	3-4	0.06	0.09	0.08	0.10	0.14	0.18	0.21	0.23	0.24	0.13
5th	4-5	0.06	0.07	0.09	0.09	0.13	0.12	0.17	0.21	0.30	0.11
6th	5-6	0.11	0.08	0.09	0.11	0.16	0.14	0.21	0.24	0.23	0.13
7th	6-7	0.08	0.04	0.08	0.09	0.16	0.19	0.29	0.09	0.12	0.11
8th	7-8	0.08	0.05	0.12	0.13	0.13	0.21	0.28	0.29	0.38	0.13
9th	8-9	0.10	0.09	0.12	0.16	0.18	0.31	0.31	0.18	0.39	0.16
10th	9-10	0.07	0.13	0.11	0.21	0.24	0.19	0.35	0.36	0.45	0.17
11th	10-11	0.10	0.17	0.18	0.22	0.25	0.24	0.38	0.44	0.33	0.19
12th	11-12	0.13	0.11	0.23	0.22	0.35	0.33	0.47	0.20	0.50	0.21
B. Average Career Years Remaining											
1st	0-1	8.09	7.67	6.34	5.65	4.96	3.98	3.21	2.86	2.59	4.99
2nd	1-2	8.88	8.18	7.01	6.01	5.29	4.46	3.53	3.24	2.89	5.70
3rd	2-3	8.77	8.14	7.11	6.09	5.11	4.65	3.75	3.65	3.13	5.94
4th	3-4	8.22	7.85	6.89	6.09	4.98	4.49	3.53	3.71	3.11	5.90
5th	4-5	7.70	7.61	6.46	5.71	4.72	4.38	3.34	3.68	2.93	5.72
6th	5-6	7.18	7.12	6.07	5.24	4.34	3.90	2.94	3.54	2.94	5.37
7th	6-7	6.97	6.69	5.60	4.83	4.06	3.47	2.60	3.52	2.68	5.10
8th	7-8	6.54	5.96	5.03	4.25	3.76	3.18	2.43	2.83	1.98	4.69
9th	8-9	6.07	5.28	4.65	3.81	3.24	2.89	2.19	2.79	1.89	4.32
10th	9-10	5.66	4.75	4.22	3.42	2.85	2.96	1.96	2.29	1.77	4.03
11th	10-11	5.02	4.40	3.69	3.21	2.57	2.54	1.75	2.28	1.83	3.75
12th	11-12	4.50	4.22	3.38	2.99	2.27	2.17	1.50	2.70	1.50	3.53

Source: Derived from *Total Baseball*, 6th Edition, 1999.

Table 3: The Effects of Player Rating on the Risk of a Career Ending and on the Average Career Years Expected for Position Baseball Players, 1902-1985.

Year of Play	Career Length	Extremely Positive > 0.5	Positive < 0 - 0.5	Negative 0.5 - 0	Extremely Negative < -0.5	All Ratings
A. Proportion of Careers Ending During Interval						
1st	0-1	0.06	0.19	0.34	0.21	0.28
2nd	1-2	0.06	0.15	0.21	0.20	0.19
3rd	2-3	0.06	0.14	0.16	0.16	0.15
4th	3-4	0.07	0.12	0.14	0.14	0.13
5th	4-5	0.07	0.10	0.13	0.10	0.11
6th	5-6	0.08	0.11	0.14	0.14	0.13
7th	6-7	0.09	0.10	0.13	0.11	0.11
8th	7-8	0.11	0.10	0.14	0.14	0.13
9th	8-9	0.11	0.15	0.16	0.18	0.16
10th	9-10	0.16	0.19	0.19	0.20	0.17
11th	10-11	0.21	0.20	0.21	0.20	0.19
12th	11-12	0.21	0.25	0.21	0.25	0.21
B. Average Career Years Remaining						
1st	0-1	8.48	5.93	4.38	5.23	4.99
2nd	1-2	8.00	6.18	5.36	5.50	5.70
3rd	2-3	7.48	6.18	5.67	5.72	5.94
4th	3-4	6.95	6.10	5.66	5.70	5.90
5th	4-5	6.45	5.87	5.48	5.51	5.72
6th	5-6	5.89	5.47	5.20	5.06	5.37
7th	6-7	5.38	5.08	4.94	4.83	5.10
8th	7-8	4.83	4.57	4.61	4.35	4.69
9th	8-9	4.39	4.04	4.26	3.98	4.32
10th	9-10	3.88	3.66	3.97	3.76	4.03
11th	10-11	3.50	3.42	3.77	3.55	3.75
12th	11-12	3.29	3.13	3.61	3.31	3.53

Source: Derived from *Total Baseball*, 6th Edition, 1999.

Table 4: The Effects of Era on the Risk of a Baseball Career Ending and on the Average Career Years Expected for Position Baseball Players, 1902-1985.

Year of Play	Career Length	Deadball 1902-1920	Golden Age 1921-1937	War/Post 1938-1955	Expansion 1956-1970	Free Agency 1971-1985	All Eras
A. Proportion of Careers Ending During Interval							
1st	0-1	0.40	0.33	0.29	0.15	0.14	0.28
2nd	1-2	0.27	0.24	0.20	0.13	0.13	0.19
3rd	2-3	0.20	0.16	0.18	0.10	0.13	0.15
4th	3-4	0.16	0.18	0.15	0.08	0.11	0.13
5th	4-5	0.17	0.10	0.12	0.09	0.09	0.11
6th	5-6	0.15	0.14	0.15	0.12	0.11	0.13
7th	6-7	0.15	0.13	0.13	0.11	0.08	0.11
8th	7-8	0.14	0.13	0.11	0.15	0.13	0.13
9th	8-9	0.17	0.12	0.17	0.16	0.15	0.16
10th	9-10	0.15	0.17	0.22	0.16	0.16	0.17
11th	10-11	0.21	0.20	0.24	0.15	0.20	0.19
12th	11-12	0.14	0.24	0.23	0.21	0.23	0.21
B. Average Career Years Remaining							
1st	0-1	3.58	4.27	4.53	6.83	6.59	4.99
2nd	1-2	4.61	5.15	5.20	6.93	6.58	5.70
3rd	2-3	5.12	5.59	5.40	6.85	6.50	5.94
4th	3-4	5.28	5.56	5.44	6.57	6.35	5.90
5th	4-5	5.19	5.69	5.31	6.11	6.06	5.72
6th	5-6	5.14	5.27	4.97	5.63	5.63	5.37
7th	6-7	4.95	5.03	4.78	5.31	5.25	5.10
8th	7-8	4.74	4.68	4.43	4.90	4.64	4.69
9th	8-9	4.43	4.30	3.90	4.68	4.24	4.32
10th	9-10	4.25	3.84	3.60	4.48	3.90	4.03
11th	10-11	3.92	3.51	3.45	4.25	3.54	3.75
12th	11-12	3.82	3.26	3.36	3.90	3.28	3.53

Source: Derived from *Total Baseball*, 6th Edition, 1999.

Figure 1: Career Survival Curves by First Year Player Rating, Position Baseball Players, 1902-1985

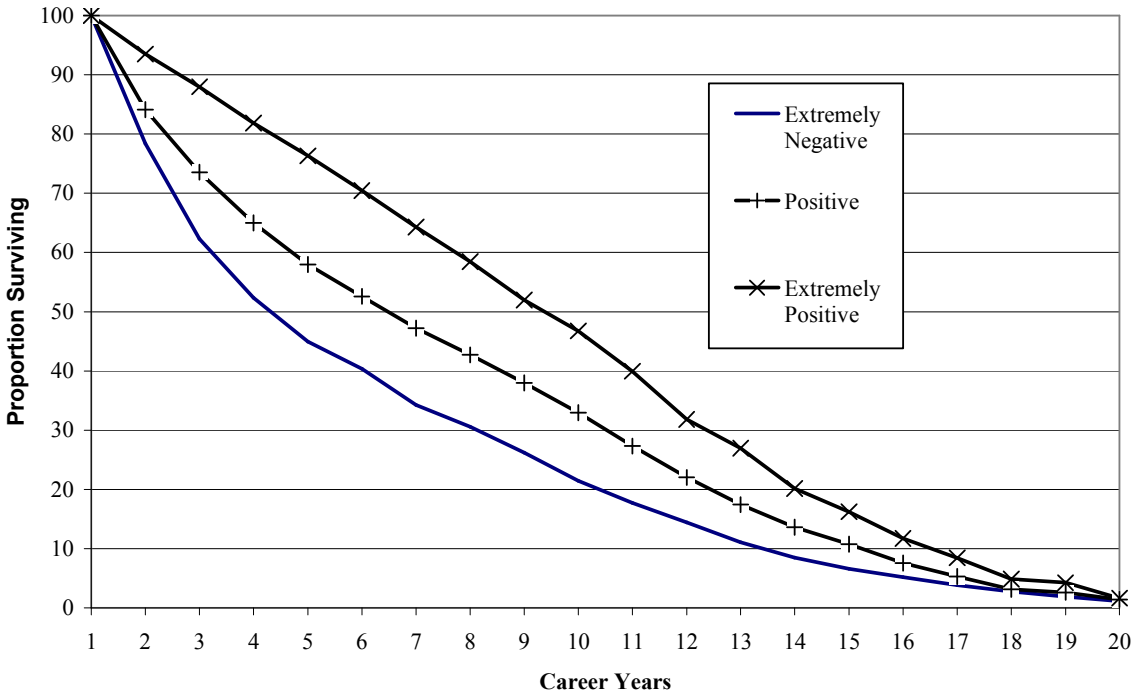

Figure 2: Career Survival Curves By Era, Position Baseball Players 1902-1985