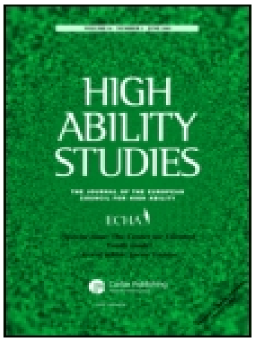

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Staying at the top: playing position and performance affect career length in professional sport

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In an effort to understand the process of skill acquisition and decline, researchers have largely neglected a critical aspect of this development – maximizing time at the highest levels of achievement. This study examined length of career for professional athletes in basketball, football, ice hockey, and baseball and considers whether career length differed by position and player performance (standardized career performance). Results revealed career length differences among positions in baseball and football but not basketball and ice hockey. In all sports, longer careers were associated with superior performance, reinforcing the notion that performance is a critical indicator of career length and suggesting positional demands influence career length. Results highlight the need for further work on this important stage of development.

Keywords: athlete; skill acquisition; expertise; development

Introduction

Over the past 40 years, the study of how elite performers acquire their exceptional skill has grown from a small group of scientists almost exclusively from cognitive psychology to a branch of science embracing a range of disciplines and theoretical frameworks (see Ericsson, Charness, Feltovich & Hoffmann, 2006, for a review). Over this time span, our understanding of how someone gets to the highest levels of performance has been improved in important ways. Additionally, we have some understanding of how skills and capabilities are affected by age and decreases in practice (see Horton, Baker, & Schorer, 2008; Krampe & Charness, 2006, for a review). However, in an effort to understand the developmental process of skill acquisition and decline, researchers have largely neglected a critical aspect of this development – maximizing the amount of time at the highest levels of achievement. Put more simply, considerable time has been spent understanding the journey but not maximizing the amount of time at the destination.

Models of expertise across the life span

Models of expertise development typically propose that athletes move through qualitatively different stages on the path from novice to expert. For instance, the Developmental Model of Sport Participation (Côté, Baker, & Abernethy, 2007)

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proposes that for most experts the initial period of involvement comes in the form of 'sampling' several sports with an emphasis on fun and unstructured enjoyment. This stage is followed by a 'specializing' period where the developing athlete focuses on a small number of sports with an increasing emphasis on more deliberate, effortful forms of training. Finally, athletes reach the 'investment' stage which is delineated by an intensive, solitary focus on large amounts of high-quality training, usually conducted by expert coaches with exceptional sporting peers. However, this model does not discuss the factors related to augmenting the time at the expert level other than suggesting that 'investment' is a critical factor.

Starkes, Cullen and MacMahon (2004) proposed a stage-based model where the final stage of development was 'transcendent expertise,' a stage where participants make unique contributions to their sport and establish themselves as 'masters' of their domain. However, the authors lament the fact that there has been little research specifically investigating this ultimate stage of development. Moreover, as the authors describe it, the 'transcendent' stage represents a different stage of expertise, more akin to genius, and outside the levels most 'routine experts' are capable of attaining.

The 'expert' stage of development

Although there has been minimal work focused on understanding the expert phase of development, when viewed differently it could be argued that researchers have revealed a considerable amount about experts, especially about the qualities that characterize their expertise. For instance, sporting experts from time-constrained decision-making sports such as tennis and squash demonstrate highly specific cognitive and perceptual adaptations that allow them to use advanced visual information to anticipate their opponents' actions (see Mann, Williams, Ward, & Janelle, 2007; Williams, Davids, & Williams, 1999, for a review). Further, experts display superior psychological skills (e.g. coping strategies and the ability to manage performance emotions) to lesser skilled performers (see Gould & Maynard, 2009, for a review).

However, this work has almost exclusively dealt with expert/novice or expert/nonexpert comparisons and while these designs inform our understanding of the mechanisms of expert performance, they contribute very little to knowledge about performance across this stage of development. Knowledge of the factors affecting the length of a performer's time at the 'expert' stage of development has implications for understanding how skills can be maintained in the face of advancing age since an accurate profile of how physical and cognitive performance declines over time is essential to our understanding of the aging process. Most models of age-related decline (e.g. Bortz & Bortz, 1996) suggest an inevitable decline following 'peak performance' but with little attention given to how long the period of peak performance may (or can) last. However, researchers have shown that performance in skilled sports tasks can be maintained at a much better rate than previously thought. For instance, studies of cognitive and motor performance suggest it can be maintained at high levels in spite of advancing age, provided there is continued involvement in the activity. Charness' (1981) study of chess players found that high levels of performance could be maintained as performers got older and other examinations of cognitive-motor experts, such as pianists (Krampe & Ericsson, 1996), typists (Salthouse, 1984), handball goalkeepers (Schorer & Baker, 2009), and golfers (Baker, Horton, Pearce, & Deakin, 2007), substantiate these findings.

Greater understanding of the 'expert' stage of performance would be beneficial for linking models of skill acquisition to models of skill maintenance and age-related decline. Moreover, knowledge of this phase of development might facilitate the creation of more comprehensive models of the development of skill across the life span. In this paper, we focus on understanding the length of the expert phase of development, more commonly known as 'career length.'

Career length

There has been little investigation of the length of time athletes can aspire to remain at the 'top of their game' arguably because these data are difficult to obtain prospectively. However, historiometric methods (see Simonton, 2003, 2006) that involve the examination of the historical records of imminent persons can be beneficial for investigations of this nature. Fortunately, the proliferation of Internet archives of reliable and valid information makes this task more feasible today than it was previously.

There has been some previous study of career length in sports. Among these, the focus has been on racial inequalities and their influence on career length (Best, 1987; Hoang & Rascher, 1999), how specific medical treatments affect career length in attempts to understand their efficacy (e.g. Brophy et al., 2010), or how the length of one's sports career predicts mortality (e.g. Abel & Kruger, 2005). However, few have examined career length as it relates to models of skill acquisition and life span development. A possible exception is the study by Abrams, Barnes, and Clement (2008), which examined pre-professional performance statistics (i.e. college performance) to determine the extent to which they predicted length of career in the National Basketball Association (NBA), noting that college values predicted length of career for guards and forwards but not for centers.

Despite the relative paucity of research in sport, career length has been extensively examined in other fields of human achievement. Simonton has presented several excellent investigations of life span creative output in the arts and sciences (see Simonton, 1999, for a review of this work). However, there has been some vagueness in how career length has been defined. For instance, Simonton (1997) defined it as the length of time an individual has been making an active contribution to their domain, which assumes that productivity meets a minimum standard. This may be problematic in some domains where it is impossible to view later achievements without reference to earlier achievements (e.g. film directors or composers, see Zickar & Slaughter, 1999). Thankfully, professional sports provide an excellent venue for investigating this phenomenon since career length at the highest level is ultimately determined by participation. More simply, when one stops making high-level contributions they are removed from the system (e.g. by contracts not being renewed or being relegated to lower levels of competition).

In this study, we focus on the length of career for professional athletes from the sports of basketball, American football (hereafter referred to simply as 'football'), ice hockey, and baseball. More specifically, we considered the range of career lengths in these sports with specific attention to the relationships between career length, playing position, and performance. Given the limited research in this area, our hypotheses were largely exploratory; however, based on the assumption that performance demands differ according to playing positions, we hypothesized that career length would differ by position. Furthermore, we explored whether there was a linear relationship between career length and performance in the sport. Although this relationship seems logical (i.e. better performance should predict longer careers) different patterns are also possible. For example, a role player (e.g. an 'enforcer' in ice hockey) might not have the best performance measures, but fulfils the requirements of his role and therefore stays in the system. Conversely, a superstar with high-performance measures might leave the system early due to injury.

Methods

Data were collected from official archives for NBA, National Football League (NFL), National Hockey League (NHL), and Major League Baseball ([MLB]; i.e. nba.com, nfl.com, nhl.com, and mlb.com). These sports represent the four largest professional sports in North America. Athletes in the current study were 'drafted' to play in these leagues between 1980 and 1989. Examination of the data confirmed that all athletes were retired from competition. Between 1980 and 1989, 476 players were drafted into the NBA,[1] 3341 into the NFL, 1776 into the NHL, and 3927 into MLB.

In addition to total career length, playing position was recorded to consider differences among positions on career length. Position information was limited to positions used in the official archives. For the basketball players, only three positions were consistently reported: guard, forward, and center. To simplify the analyses, positions in football were organized into four groups based on performance demands and availability of performance statistics. 'Defensive Linemen' included defensive ends, defensive tackles, and nose tackles. 'Defensive Skill Positions' included linebackers and defensive backs. 'Offensive Skill Positions' included running backs and wide receivers. Quarterbacks were considered as a separate group. For ice hockey, positions included forward, defense, and goaltender, and for baseball the positions included pitcher, catcher, infielder, and outfielder.

Furthermore, the analyses considered several performance variables provided in the official databases. For the NBA, they included average minutes played per game, average points scored per game, average field goal percentage, average three-point percentage, average free throw percentage, average offensive rebounds per game, average defensive rebounds per game, average assists per game, average steals per game, average blocks per game, average turnover per game, and average personal fouls per game. For the NHL, performance variables included average points per game, average assists per game, and average penalty minutes per game. For both the NBA and NHL, performance variables were the same across positions. However, performance in the NFL requires different positions to play different roles and as a result, specific performance indicators were examined based on positional demands. Specifically, quarterbacks were considered on passing yards, offensive skill positions were considered on the sum of rushing yards and receiving yards, defensive skill positions were considered on sacks and interceptions, and defensive linemen were considered on sacks only. Similarly, performance characteristics in MLB were considered separately for hitters (i.e. catchers, infielders, and outfielders; batting average, home run average, runs batted in, and stolen bases) and pitchers (earned run average, number of wins, number of losses, and number of strikeouts). As is common in the varying sports, variables were standardized per game played for the basketball, ice hockey and baseball data, while for the American football data this was done by season.

While our approach was exploratory, we followed the same three-step analysis within each sport. First, we considered the entire population of drafted players to examine the career length distributions among players who made it into the league. Steps 2 and 3 focused on this subset of players. In step 2, we grouped players in each sport into five ‘career length’ categories (with approximately 20% of players in each category: very short, short, medium, long, and very long career lengths) and determined whether there were differences in career length between the varying positions using crosstabs and χ^2. A significant χ^2 test meant position needed to be controlled for in further analyses (i.e. in step 3). In step 3, we conducted ANOVAs to determine whether the career length groups differed on each sport’s specific performance indicators. Significant effects were examined for *post hoc* differences using the Scheffé procedure. Before using the ANOVAs we tested for normality (Kolmogornov–Smirnov tests) and variance homogeneity (Levenee tests). In some of the analyses, assumptions were violated; however, ANOVA tests are robust against those violations particularly given the size of the present sample. For all analyses PASW 18.0 was used and the criterion alpha value was set at $p < .05$.

Results

Basketball

Of the 476 players drafted, 406 players (85%) went on to play in the NBA, with the longest career being 23 seasons, $M = 8.15$, $SD = 5.44$; however, the distribution

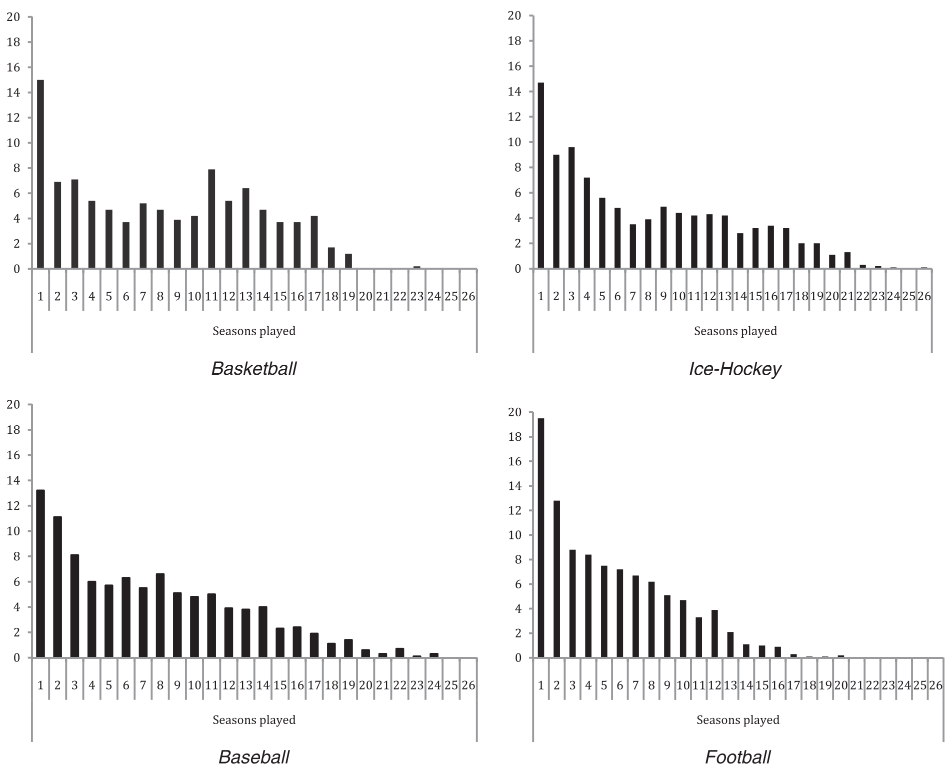

Figure 1. Relative distribution (%) of players by career length across the four leagues.

Table 1. Basketball: Career length groups X performance indicators.

DV	1	2	3	4	5	2	1	3	4	5	3	1	2	4	5	4	1	2	3	5	5	1	2	3	4
Minutes per game	9.5	+	+	+	+	14.6	+	+	+	+	20.9	+	+	+	+	24.2	+	+	+		27.1	+	+	+	
Points per game	3.6	+	+	+	+	5.9	+	+	+	+	8.8	+	+		+	10.3	+	+			12.3	+	+	+	
Field goal %	41.5		+	+	+	44.3				+	46.4	+				47.1	+				48.0	+	+		
3Point %	8.0	+	+	+	+	15.9	+		+	+	20.1	+				23.6	+	+			26.1	+	+		
Free throw %	60.4	+	+	+	+	70.8	+				73.3	+				74.2	+				76.2	+			
Offensive rebounds per game	.6	+	+	+	+	.9	+		+	+	1.2	+			+	1.3	+	+			1.6	+	+	+	
Defensive rebounds per game	.9	+	+	+	+	1.7	+	+	+	+	2.4	+	+		+	2.8	+	+		+	3.6	+	+	+	+
Assists per game	.8		+	+	+	1.2		+	+	+	2.1	+	+			2.5	+	+			2.7	+	+		
Steals per game	.3	+	+	+	+	.5	+		+	+	.7	+			+	.8	+	+			.9	+	+	+	
Blocks per game	.1		+	+	+	.2			+	+	.3	+			+	.4	+				.5	+	+	+	
Turnover per game	.7	+	+	+	+	1.0	+	+	+	+	1.5	+	+		+	1.6	+	+			1.8	+	+	+	
Personal fouls	1.3	+	+	+	+	1.8	+	+	+	+	2.2	+	+			2.3	+	+			2.5	+	+		

Note: Post-hoc-test by Scheffé; + equals significant differences between groups in the *post hoc* analyses.

of players was highly positively skewed (see Figure 1). χ^2 analysis did not reveal any significant differences between playing positions and career length groups, $\chi^2(8, n = 406) = 5.81$, $p = .67$, $\omega = .40$, $1 - \beta = .99$ and as a result, all positions were grouped together. ANOVAs considered differences among the career length groups, revealing significant differences between the groups in average minutes per game, $F(4, 405) = 111.98$, $p < .01$, $f = .72$, average points per game, $F(4, 405) = 59.86$, $p < .01$, $f = .77$, average field goal percentage, $F(4, 404) = 5.70$, $p < .01$, $f = .36$, average three-point percentage, $F(4, 395) = 25.31$, $p < .01$, $f = .45$, average free throw percentage, $F(4, 403) = 22.20$, $p < .01$, $f = .41$, average offensive rebounds per game, $F(4, 405) = 24.62$, $p < .01$, $f = .49$, average defensive rebounds per game, $F(4, 405) = 51.04$, $p < .01$, $f = .58$, average assists per game, $F(4, 405) = 24.16$, $p < .01$, $f = .44$, average steals per game, $F(4, 405) = 38.42$, $p < .01$, $f = .52$, average block per game, $F(4, 405) = 16.19$, $p < .01$, $f = .38$, average turnover per game, $F(4, 405) = 47.03$, $p < .01$, $f = .56$, and average personal fouls per game $F(4, 405) = 46.89$, $p < .01$, $f = .56$. As can be seen in Table 1, the players with longer careers reported higher values on the performance indicators than players with shorter careers.

Football

For the football players, 2397 out of the 3341 players (72%) drafted between 1980 and 1989 went on to play in the NFL, with a maximum career length of 25 seasons, $M = 5.46$, $SD = 4.05$ (see Figure 1). There were significant differences between career length groups and playing positions, $\chi^2(12, n = 2397) = 32.76$, $p < .01$, $\omega = .87$. As can be seen in Figure 2, there was an overrepresentation of quarterbacks in group 5 and offensive skill positions in groups 4 and 5, while there was a higher percentage of defensive linemen in group 1 and offensive skill positions in groups 1–3.

In our follow-up analysis, we conducted ANOVAs per position to test for differences between career length groups across the varying performance measures. For

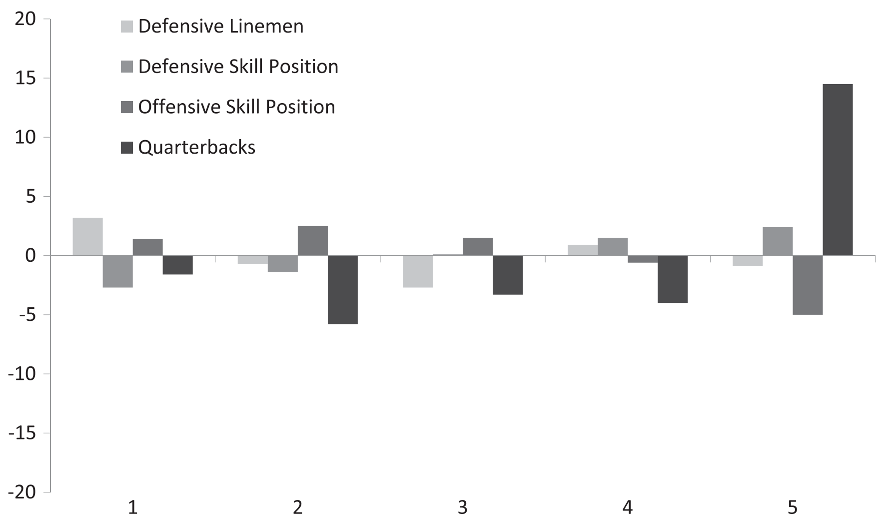

Figure 2. Football: distribution of playing positions across the career length groups. Note: values above zero represent proportions above expectations and values below zero represent proportions below expectations.

defensive linemen, an ANOVA with sacks as the dependent variable was calculated. The results showed clear differences between groups of career length, $F(4, 243) = 35.59$, $p < .01$, $f = .76$. *Post hoc* analyses revealed significant differences between group 4, $M = 2.79$, SD = 1.63, and groups 2, 3, and 5, as well as between group 5, $M = 4.91$, SD = 2.65, and all other groups. All other groups had less than an average of 1.78 sacks.

For the defensive skill positions, we analyzed sacks and interceptions as dependent variables. Significant differences were revealed between career length groups for sacks, $F(4, 407) = 7.18$, $p < .01$, $f = .26$, and for interceptions, $F(4, 473) = 4.95$, $p < .01$, $f = .20$. Group 5 outperformed all other groups and *post hoc* analyses demonstrated significant differences from groups 3 and 4 for sacks. For interceptions, group 3 (worst performance) differed significantly from groups 4 and 5. No other *post hoc* test demonstrated significance.

For offensive skill positions, the sum of receiving and rushing yards was analyzed. Again, significant differences were revealed, $F(4, 431) = 67.33$, $p < .01$, $f = .75$. There was an increase in the average sum of receiving and rushing yards as career length increased. All *post hoc* comparisons, except between groups 1 and 2, reached significance.

For quarterbacks, average passing yards per season was the performance indicator and again significant differences were revealed, $F(4, 91) = 17.94$, $p < .01$, $f = .67$. *Post hoc* comparisons revealed significant differences only between group 5 and all other groups. Group 5 had an average of 1552 passing yards per season, while all other groups had less than 800 yards.

Ice hockey

For ice hockey, 756 out of the 1776 players drafted did not play a single game in NHL. For the remaining 1020 players (57%), the longest career length was 26 years, $M = 7.83$, SD = 5.84, and there was a negatively skewed distribution (Figure 1). There were no significant differences between career length group and the

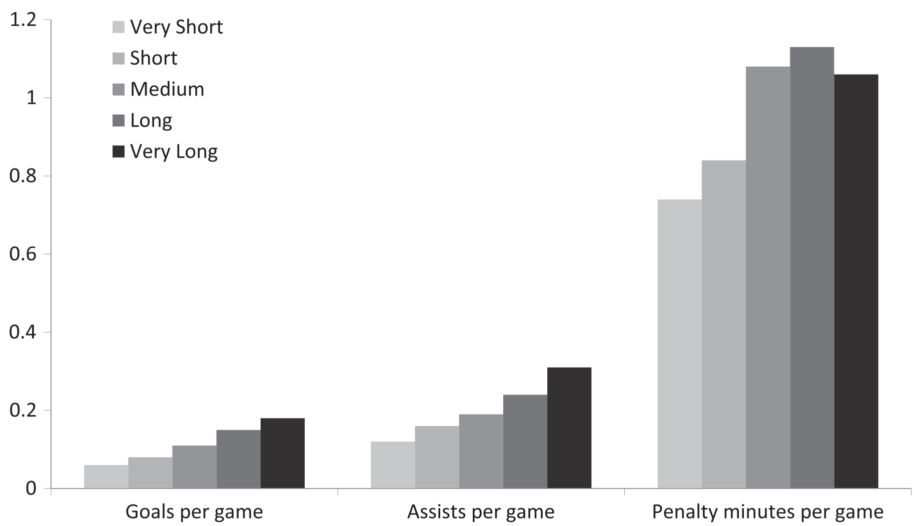

Figure 3. Ice hockey: performance across the career length groups.

different ice hockey positions, $\chi^2(8,\ n = 1020) = 5.41$, $p = .71$, $\omega = .61$, $1 - \beta > .99$. An ANOVA including all positions indicated significant differences between the career length groups for average goals per game, $F(4, 1019) = 36.28$, $p < .01$, $f = .35$, average assists per game, $F(4, 1019) = 46.37$, $p < .01$, $f = .39$, and average penalty minutes per game, $F(4, 1019) = 6.70$, $p < .01$, $f = .16$. *Post hoc* tests demonstrated many significant differences between the groups for goals per game. Only the comparisons between groups 1 and 2, groups 2 and 3, and groups 4 and 5 were nonsignificant. As can be seen in Figure 3, players staying in the system longest had the highest rate of goals per game. For assists per game, the only nonsignificant comparisons were between groups 1 and 2 as well as groups 2 and 3. Again, the athletes staying in the system longest outperformed the others. For average penalty minutes per game, significant *post hoc* differences were found between group 1 and all other groups, but no other significant *post hoc* differences were found.

Baseball

Among the 3927 players drafted into MLB, only 1061 athletes (27%) played for at least one season. The maximum career length for this sample was 26 seasons, $M = 7.83$, $SD = 5.84$ (see Figure 1 for the distribution of players by career length). The crosstab between career length groups and playing positions revealed significant differences, $\chi^2(12,\ n = 1061) = 26.66$, $p < .01$, $\omega = .65$. As can be seen in Figure 4, there was an overrepresentation of outfielders and catchers in group 1, of pitchers in groups 2 and 3, and of infielders in groups 4 and 5.

Our analyses of differences between career length groups per position on the performance variables are presented in Table 2. For *outfielders* significant differences occurred for batting average, $F(4, 184) = 3.35$, $p = .01$, $f = .26$, home run average, $F(4, 185) = 25.76$, $p < .01$, $f = 1.01$, runs batted in, $F(4, 185) = 34.71$,

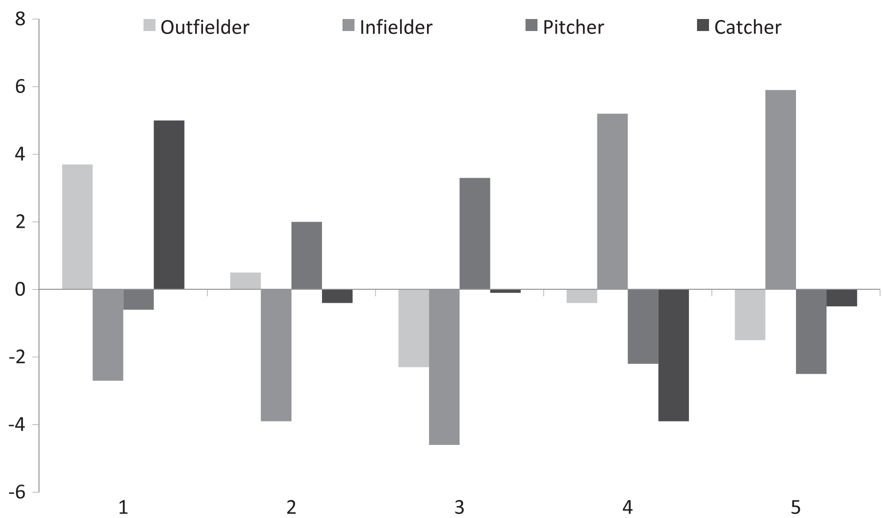

Figure 4. Baseball: distribution of playing positions across the career length groups. Note: values above zero represent proportions above expectations and values below zero represent proportions below expectations.

Table 2. Baseball: Career length groups X performance indicators.

Position	DV	1	2	3	4	5	2	1	3	4	5	3	1	2	4	5	4	1	2	3	5	5	1	2	3	4
Outfielders	BA	.21				+	.22					.23					.25					.27	+			
	HR	.02		+	+	+	.04				+	.06	+			+	.06	+			+	.12	+	+	+	+
	RBI	.13		+	+	+	.22				+	.26	+			+	.30	+			+	.046	+	+	+	+
	SB	.03				+	.03				+	.08					.06					.10	+	+		
Infielders	BA	.18	+	+	+	+	.22	+		+	+	.24	+				.26	+	+			.24	+	+		
	HR	.02			+	+	.03			+	+	.05				+	.07	+	+		+	.11	+	+	+	+
	RBI	.18		+	+	+	.18		+	+	+	.28	+	+		+	.36	+	+		+	.45	+	+	+	+
	SB	.02				+	.02				+	.04					.04					.06	+	+		
Catcher	BA	.16		+	+	+	.22					.23	+				.24	+				.25	+			
	HR	.02				+	.05					.05					.06					.08	+			
	RBI	.13	+	+	+	+	.23	+			+	.27	+				.30	+				.37	+	+		
	SB	<.01					<.01					.02					<.01					.01				
Pitcher	W	.07		+	+	+	.10			+	+	.14	+			+	.17	+	+		+	.24	+	+	+	+
	L	.18					.16					.17					.18					.20				
	ERA	5.94	+	+	+	+	4.91	+			+	4.53	+				4.21	+				3.99	+	+		
	SO	1.57				+	1.53				+	1.65				+	2.30					2.78	+	+	+	

Note: BA = batting average, HR = home runs, RBI = runs batted in, SB = stolen bases, W = wins, L = losses, ERA = earned run average, SO = strikeouts. *Post hoc* test by Scheffé; + equals significant differences between groups in the *post hoc* analyses.

$p < .01$, $f = .66$, and stolen bases, $F(4, 184) = 7.00$, $p = .01$, $f = .36$ with higher performances found for athletes with longer careers.

For *infielders* again significant differences were demonstrated for batting average, $F(4, 278) = 27.53$, $p < .01$, $f = .53$, home run average, $F(4, 281) = 27.86$, $p < .01$, $f = .53$, runs batted in, $F(4, 281) = 41.52$, $p < .01$, $f = .61$, and stolen bases, $F(4, 281) = 5.86$, $p = .01$, $f = .28$. Descriptive trends suggest that higher performance scores were associated with higher career length, although group 4 was higher than group 5 for batting average.

Similarly, for *catchers* significant differences were seen for batting average, $F(4, 81) = 7.80$, $p < .01$, $f = .53$, home run average, $F(4, 81) = 4.56$, $p < .01$, $f = .44$, runs batted in, $F(4, 81) = 17.52$, $p < .01$, $f = .69$, and stolen bases, $F(4, 81) = 2.48$, $p = .05$, $f = .33$. For the first three dependent variables, higher performances were shown with increases in career length; however, for stolen bases the observed differences were minimal.

For *pitchers*, significant differences were revealed for win average, $F(4, 502) = 32.91$, $p < .01$, $f = .46$, earned run averages, $F(4, 468) = 27.80$, $p < .01$, $f = .44$, and strike out averages, $F(4, 233) = 7.61$, $p < .01$, $f = .34$ with higher performances within the longer career groups. No differences were demonstrated for average losses, $F(4, 502) = 1.02$, $p = .39$, $f = .09$, $1 - \beta = .32$.

Discussion

This study extends a very limited literature base on career length in professional sport. Descriptive analysis shows that career length in all sports was highly positively skewed with some differences between sports, particularly in the proportion of drafted players who never make it to play at the professional level (c.f. 15% in the NBA but 73% in MLB). These data speak, at least indirectly, to the effectiveness of the various drafts at identifying 'talent' (see also Koz, Fraser-Thomas & Baker, 2012).

The primary aim of this investigation was to consider differences in career length among the various positions and explore the relationship between career length and performance outcomes. Our exploratory results highlighted several consistent trends across sports as well as some inconsistencies. In order to adequately discuss all of these results, we start with brief discussions of the individual sports followed by a general discussion across sports.

Interestingly, there were no differences in career length among the positions in basketball suggesting that all players have similar lengths of career regardless of differences in positional demands. Examination of the performance statistics indicated that players with longer careers typically had better performance, even though these measures were standardized to reflect 'per game' performance. Ice hockey was similar to basketball in that there were no differences between the ice hockey positions. Furthermore, the ice hockey data supported the trend for players with longer careers having greater performance than those with shorter careers. Although it is important to note that there should be obvious differences between playing positions on these performance indicators in both sports (e.g. forwards should score more than goaltenders in ice hockey), we did not consider them separately because no differences in career length were observed and the relationship between career length and performance was the focus of this study.

Significant position differences were noted in football with quarterbacks and defensive skill positions more likely to be in the longer career group than offensive skill positions or defensive lineman. Given the specific performance demands of football, including the increased risk of injury for certain positions (c.f. tackle vs. quarterback), these differences are perhaps not surprising. When the specific performance indicators for each position were examined, the results again highlighted the trend where players who had longer careers also had superior performance.

The baseball data reinforced this trend of better performance among players with longer careers. Furthermore, there were significant differences in career length between the baseball positions with outfielders and catchers tending to have shorter careers than infielders, with pitchers more often reflected in the medium-sized career length group. While a case could be made for the difference between pitchers and all other positions due to the unique nature of the pitcher's position, it is not readily apparent why there would be a difference between infielders, outfielders, and catchers, although injury risk seems to be a viable possibility (Fleisig, McMichael, & Andews, 2010). Interestingly, there has been little research done on the unique performance demands of different baseball positions and this presents an interesting avenue for future work.

What is clear from the discussion above is the remarkable consistency in the relationship between performance outcomes and career length, despite the outcomes differing considerably; for instance, penalty minutes and goals scored in ice hockey showed the same relationship. At the least, this consistency highlights the critical relationship between different forms of performance contribution and increased career length.

When viewed collectively, the results show that our hypothesis that different positions would have different career lengths was only partially supported. There were no differences in basketball and ice hockey players despite clear differences between the demands of some of these positions (c.f. the demands of a forward vs. a goaltender in ice hockey). We are unable to explain the different mechanisms causing these differences, but it is possible that the type of interaction players have in these sports affects career length. For instance, baseball and football players typically have very clear roles on the field with their interactions largely restricted while the roles for players in basketball and ice hockey may be less clearly defined. There is also some research indicating that certain playing positions in football (Shankar, Fields, Collins, Dick, & Comstock, 2007) and baseball (Fleisig et al., 2010) are at increased risk of injury than other positions, which may ultimately affect career length.

Similarly, injuries likely play an important role in career length and we were unable to account for these in this exploratory study. It seems logical that within the short career length groups, there were players with the same potential to reach the longer career length groups but unable to do so due to injuries or reasons other than performance. These players would have affected our analysis of players in the shorter career groups but not the longer ones. Exploring the reasons for early exit from a professional sports career might be a worthwhile follow-up to this initial exploratory study.

Another limitation to our data is that the position information provided by the basketball and ice hockey archives may have been insufficient to reflect the nuances of the different positions in these sports. For example, it is common for a player in professional basketball to play different positions (e.g. a guard who also plays forward); moreover, even within our positions there are further divisions that were possible, such as a between right wing, left wing, and centers in the 'forwards' group in ice hockey. Similarly, it is important to remember that these players operate as part of a team and popular sport discussions have highlighted individual players (e.g. Horace Grant or Dennis Rodman in professional basketball) with the ability to fill specific roles in their team. Our data-set did not allow us to consider how an individual player's performance interacted with their teammates', so while it was necessary to limit our groups to keep statistical comparisons to a manageable size this may have increased the variability within each category.

To summarize, the relationship between performance and career length was consistent across the sport groups. Players with longer careers typically had better average performance per year than players with shorter careers. On the one hand, this result is not surprising given that a player's ultimate worth should be measured by the position-specific performance indicators examined in this study. On the other hand, this result has not been statistically tested until now and given previous research highlighting the importance of draft round (Staw & Hoang, 1995) and pre-career performance indicators (Abrams et al., 2008), it is important to establish the relationship between performance during the career and the length of career. Analysis of the development of individual performance data would add further depth to this discussion since it is possible that career length is predicted not only by one's own performance from year to year, but also by one's performance relative to their sport peers (i.e. intra and inter-personal performance variability). Moreover, there is some evidence (e.g. Staw & Hoang, 1995) that career length is correlated with draft round, even after performance variation has been controlled, suggesting that players drafted earlier are given unequal opportunities to compete compared to players drafted later. These issues provide fruitful avenues for future research. What is clear is that increased attention should be paid to maximizing the amount of time at the highest levels of performance through additional study of this important phase of development. Greater attention to this area may be invaluable for life span models of skill development that aim to adequately bridge the gap between skill acquisition and age-related decline.

Note

1. During the 1980s, the professional basketball draft decreased from 10 rounds to two rounds and as a result, data were only collected for the first two rounds for all years in order to remain consistent.

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