

The Relationship Between Age and Performance  
Across Professional Athletes Playing in a Forward  
Position in the Premier League

by

Nicolas Brito

Submitted to the Department of Economics

School of Natural and Social Sciences

In partial fulfillment of the requirements

For the degree of Bachelor of Arts

Purchase College

State University of New York

May 9, 2022

First Reader: Yulia Chikish

Second Reader: Sanford Ikeda

## **Abstract**

Coaches, managers, executives, and fans share a keen interest in determining the peak age for professional soccer players. However, current evidence is primarily based on anecdotal and subjective observations. To address this gap, this paper formally analyzes the peak or optimal age in men's professional soccer. The study concentrates on 559 forwards who played in the Premier League. The data covers the 2000-01 to 2022-23 seasons and was collected from FBref.com. The study concentrates on the forward position. I use the number of games played per season and the number of goals scored as performance measures. To estimate the effect of age on performance, an individual-level fixed effect model was used. The findings indicate that forwards peak at 25 in terms of games played per season, and at 28 in terms of the number of goals scored. The study's outcomes carry significant implications as they can aid managers in deciding the optimal time to acquire a player. By understanding when a player will attain their maximum potential, managers can also optimize their revenue as players will hold a higher valuation during this period of time. To expand upon this investigation, future researchers might consider incorporating additional leagues and analyzing data over longer timeframes.

# Table of Contents

Introduction.....	3
Literature Review.....	5
Peak Performance Trends in Soccer .....	5
Cognitive Effects of Age on Player Performance.....	7
Effect of Age on Match-Physical Performance Variability .....	7
The Impact of Performance, Age, and Position in Goal-Scoring Opportunities .....	9
Takeaways and Motivations for This Paper.....	11
Data .....	12
Methodology .....	14
Results.....	15
Limitations .....	17
Conclusion .....	18
References.....	20

## **Introduction**

Among soccer fans across the globe, it has been heavily debated when players reach their peak age; the age when players perform their best. In different sports, the age at which an athlete peaks varies depending on a series of factors, such as an athlete's commitment to preparation on a technical, mental, and physical level (Cohn, 2019). While it is standard practice for all professional athletes that are committed to their sport to maintain their fitness, peak performance is only ever achieved after years of commitment to an athletic routine. Peak performance can be better described as an extended time period in which a player is consistently performing their best. In most cases, peak performance for elite players lasts for the duration of one or two seasons and can oftentimes be associated with the time period in which the market value of these experienced athletes is at its highest (Kallén et al., 2019).

Peak performance may look different among soccer players, depending on their position. One such example could be observed when attempting to measure the peak performance of a goalie and a forward. While a goalie's peak performance is often measured by the number of successful saves that they are able to make against shots on goal, a striker's peak performance tends to be measured by the number of goals they are able to score for their team. Therefore, the position of a player is a key factor towards measuring peak performance, as each position is unique in carrying out a specific task during a match (Dendir, 2016).

Csukonyi et al. (2012) argues that the peak performance of a player should be looked at individually, rather than holistically. This is mainly because many factors, such as individual ability and the current level of an athlete contribute toward what peak performance looks like for individual athletes. An analogy that could be used to explain this concept would be the case of two

forwards reaching the season of their peak performance at the age of 25. While forward A breaks their goal-scoring record and scores 32 goals during the season due to years of preparation that lead to his performance, the same could apply to forward B with the difference of forward B scoring fewer goals. Thus, the optimal peak performance of a player varies based on preparation in the previous years leading up to their breakthrough season (Cohn, 2019). Depending on the level of preparation and individual factors such as staying in shape, it is not uncommon to see older players that are past their prime perform better than their younger counterparts during the season of their peak performance.

The purpose of this paper is to examine the relationship between age and goal contributions across professional athletes playing in a forward position. This paper draws on data that relates to individual statistics of forwards from the 2000-01-2022-23 seasons within the Premier League. For data-collecting purposes, forwards will be classified as players in the following positions: Center Forwards, Strikers, Left Wingers, and Right Wingers. Forwards that play a midfield position will be excluded from the study as their performance variables, like goals scored, may be skewed due to the player alternating between different positions. The rest of the paper will then be organized in the following order. We will first review the trends and main factors that affect performance in soccer players to guide our understanding of how age could affect performance. The details of the methods used are then presented followed by the results obtained. Ultimately, the paper will conclude by discussing the key findings, implications, and limitations of the study.

## **Literature Review**

My paper builds upon prior research that investigates the age of peak performance of soccer players. As this paper examines the relationship between age and goal contributions by forwards, I examine three streams of related literature. First, I discuss the trends of peak performance in professional soccer players across a variety of professional leagues. Second, I summarize previous literature discussing how age affects soccer players' performance in an attempt to better understand why soccer players peak when they do. In my third section, I discuss how the factors affecting playing performance relate to goal-scoring opportunities by forwards in soccer. The last section of the literature review will discuss the key takeaways and limitations of the previous literature and by doing so discuss the motivation for this paper.

### **Peak Performance Trends in Soccer**

According to Dendir (2016), the age at which a soccer player peaks varies based on essential factors such as their position. The study investigated the peak age in professional men's soccer from the 2010-11 season up until the 2014-15 seasons using the performance ratings of players in the top four leagues of Europe. Using a bivariate approach and simple age distribution models, he found that the age at which players peaked varied. The findings indicate that the average professional soccer player peaked between the ages of 25-27. More specifically, the average forward peaked at the age of 25, and the average defender peaked at 27. Regarding midfielders, he found that they peaked between the general ages of 25-27. The findings of Dendir (2016) suggest that forwards peak at a much younger age than other positions in soccer, which means that by the time players in non-forward positions reach their peak performance at 27, the peak performance of forwards would already be gradually declining.

Whereas Dendir (2016) investigated the peak performance of players across the top four major leagues in Europe, Jamil and Kerruish (2020) concentrated on the Premier League. They collected data on seasonal statistics for 637 professional football players playing in the English Premier League across 3 intermittent seasons. By using a series of one-way ANOVA tests to determine the most productive years of a player's career, they found that age had no bearing on the technical performance levels of goalies, defenders, and midfielders. However, they did find this to be the case when examining the performance of forwards. According to their findings, Wingers aged between 16-25 had significantly more shots on target and more attempts from open play than Wingers over the age of 26. Furthermore, the results of the study also revealed that strikers aged between 21-25 were more effective at carrying out in-game actions than older strikers aged between 26-30. More specifically, strikers aged between 21-25 were more successful in executing specific attacking actions, such as shots on the target outside the box and scoring goals from outside the box.

The results of the previous two studies may seem contradictory in regard to peak performance not being observed in midfielders, defenders, and goalies due to the number of leagues observed and methods used. While Dendir (2016) observed four leagues and collected data on 5 seasons for each league, Jamil and Kerruish (2020) only concentrated on one league and collected data on 3 seasons. The methods used in both studies also differ substantially, as Dendir (2016) used age distribution models and Jamil and Kerruish (2020) conducted a series of one-way ANOVAs. However, there are some interlocking findings. Jamil and Kerruish's (2020) findings of strikers aged between 26-30 being less effective at scoring goals from outside the box than

strikers aged 21-25 support Dendir's (2016) findings that forwards peak at the age of 25, since they suggest that strikers performance in regard to scoring begins to drop after this age.

### **Cognitive Effects of Age on Player Performance**

Understanding how age affects a soccer player's performance is important because it can provide more insight in regard to why players peak at their respective ages. To investigate perceptual-cognitive abilities in relation to age and position in soccer, Schunmacher et al. (2018) selected 178 male soccer players and evaluated them through a series of tests known as anticipation, participation, visual and acoustic reaction tests. Dividing the participants based on age and position to analyze the correlation between age and ability, the researchers found several group differences for each category. The researchers found that in the category of anticipation, there were no significant differences between age groups and the observed time deviation (TD:  $F(8,169) = .70, p = .69$ ) and direct deviation (DD:  $F(8,169) = 1.2, p = .30$ ). However, in the category of sustained attention, there were differences in the results of the age group for correct responses (CR). Whereas age group U23 had a higher CR of 1500, younger groups had a CR of between 1100 and 1300 (Schunmacher et al., 2018). The results of this study prove that age has a correlation with performance in certain categories, but not all, when it comes to certain cognitive abilities. Moreover, the findings suggest that cognitive abilities vary based on position, as midfielders outperformed defenders and strikers in simple reaction tasks.

### **Effect of Age on Match-Physical Performance Variability**

Beyond looking at the cognitive effects of age on player performance, it is also important to look at how age affects physical performance. Lorenzo-Martinez et al. (2019) observed the



match performances of 787 soccer players competing in the first and second divisions of Spanish soccer during the 2017-18 season. The researchers classified players into six groups based on their age: G1 ( $\leq 22.5$  years), G2 (22.6–25.1 years), G3 (25.2–27.5 years), G4 (27.6–30.1 years), G5 (30.2–33.1 years) and G6 ( $\geq 33.2$  years). Once players were divided, the researchers calculated coefficients of variation (CVs), which was the measure of relative variability showing the ratio of the standard deviation to the mean. They did this for each player and the performance variables, such as total distance, low-intensity, medium-intensity, high-intensity running (HIR), sprinting, number of HIR, number of sprints, average speed and maximal speed. Ultimately, the researchers found that players under 25.2 years showed lower CVs for high-intensity activities (HIR and sprinting) in comparison with players over 33.1 years (Lorenzo-Martinez et al., 2019).

Similarly to Lorenzo-Martinez et al. (2019) but with an emphasis on evaluating the effects of age using a large-scale analysis of match physical performance in professional soccer players, Rey et al., (2019) collected their data from the first and second-division of Spanish soccer during the 2017-18 season. Their final sample contained 10,739 individual match observations on outfield players. By classifying the players into five positions and into 5 age groups (<20 years, 20-24.9 years, 25-29.9 years, 30-34.9 years, and  $\geq 35$  years), the researchers found that professional soccer players aged  $\geq 30$  year's experience significant decreases ( $p < 0.01$ ) in the total distance covered, medium-speed running distance, high-speed running (HSR) distance, sprint distance, and maximum running speed compared with younger players (<30 years). In addition, they also found that players aged  $\geq 35$  years exhibit a significant decrease ( $p < 0.01$ ) in the number of HSR, number of VHSR, and number of sprints compared with younger players (<35 years). The findings of this study are important because they suggest that younger players are in better shape than older players. However, the findings may not be as generalizable as the previous study because this

study only looked at 10,739 individual match observations. Clayfield (2022) found that each player in La Liga plays 38 games in a season. When taking this into consideration, the 787 players that were observed by Rey et al. (2019) suggest that the researchers looked at a bigger sample size due to players needing to play this amount of games.

By looking into the Bundesliga, Sal de Rellán-Guerra et al (2019) also investigated age-related physical and technical match performance changes in soccer players. They collected 14,546 observations on individual matches in the Bundesliga from 2012-2013 to the 2014-2015 seasons using a computerized tracking system. The study evaluated differences in physical and technical match performances, using variables such as total distance covered, number of fast runs, number of sprints, and percentage of successful passes. The survey results support that age plays an important role in different areas of performance for soccer players. This is exemplified by the results of soccer players ages  $>30$  in the study, as they showed lower performance in total distance covered than younger players. However, the study also determined that successful passes made by players increased with age, demonstrating that older players are more successful in all positions apart from wide midfielders.

### **The Impact of Performance, Age, and Position in Goal-Scoring Opportunities**

Understanding how match-physical performance varies among different age groups in regard to sprints can provide insight into the age in which forwards are more likely to score goals. To analyze the influence of speed and power abilities in goal situations in professional soccer, Faude et al. (2012) collected data during the second half of the 2007-8 season on videos of 360 goals scored in the Bundesliga. For players who assisted and scored a goal, the researchers observed the following actions: no powerful action, rotation (around the body's center-line),

straight sprint, change-in-direction sprint, jump, or a combination of those categories. Of the 360 goals that were observed, the researchers found that 299 of the goals were preceded by at least one powerful action of the scoring or assisting player. For both the scoring and assisting players, the results indicate that the most “powerful actions” they committed were straight sprints, as found in 45% of all the analyzed goals (Faude et al., 2012). Since Rey et al. (2019) found that older players sprint less and the present study found that sprinting is the most essential factor associated with goal scoring, the findings could suggest that older forwards may score less due to not being able to sprint as much compared to when they were younger.

Farias et al. (2018) analyzed goal-scoring frequency in 388 soccer matches of Professional, Under-20, and Under-17 competitions from Brazil and found that the greatest number of goals was scored in the Under-17 age group, which amounted to 426 goals scored. The researchers collected data on 1100 goals scored in 388 matches of the Juvenil A State Championship (U17), Junior State Championship (U20), and the First Division Championship (Professional) during the 2014-15 season. The results of the study further indicate that a greater number of goals were scored in the second half of all competitions. For the Professional, Under-20, and Under-17 competitions, these percentages amounted to 55.9%, 59.5%, and 55.6%. Moreover, they found that teams had a higher percentage of winning the match if they scored the first goal. For the Professional, Under-20, and Under-17 competitions, the winning percentages amounted to 65.3%, 71.5%, and 75.4%, with the Under-17 group having the highest winning probability (Faude et al., 2016). Overall, the findings of the present study suggest that younger forwards score the most. However, this could be explained by the fact that younger players are less developed and hence are more likely to make mistakes that lead to goals-scoring opportunities than their older counterparts (Bach, 2017).

To investigate how the position relates to goal-scoring opportunities, Simiyu (2013) aimed to analyze the pattern and trends of the goals scored during the 2010 World Cup to derive the technical and tactical innovations. The author collected data on the number of goals, the nature of play preceding a goal; the score at halftime and winning of the game; open play and set pieces; and the position of the scorers. The results indicated that about 75.86% of goals were scored from open play and the remaining goals were scored by set pieces. Additionally, the results indicated that about 53.10% of goals were scored by forwards, while the remaining 34.48% were scored by midfielders and 11.04% by defenders (Simiyu, 2013). The findings suggest that forwards are responsible for scoring the most. However, as this is a case study that only looked at goals scored during the 2010 World Cup, further research needs to be conducted to determine if the findings of this study can be generalized toward other competitions.

### **Takeaways and Motivations for This Paper**

The existing literature indicate that the effects of age on match performance are an important factor to consider when determining the peak age of professional soccer players (Lorenzo Martinez et al., 2019). However, this literature has its data limitations. For example, the leagues and competitions that were observed to determine the peak performance of players might be too small of a sample to yield generalizable results for all leagues, as was in the case study looking at the Premier League of Jamil and Kerruish (2020). Furthermore, an area of literature that will be examined in greater detail is the age of peak performance for players within the Bundesliga. The data that I will analyze will also be more recent and from a longer time period. While Dendir (2016) investigated the age of peak performance and collected data on four leagues, he used the performance ratings to determine the peak performance of all outfield players rather than

specifically focusing on forwards. Although Simiyu (2013) found that forwards are responsible for scoring the most goals in a match, the existing literature has not investigated how peak performance in forwards could be determined by indicators such as goals.

## **Data**

The following study draws on data from players in the Premier League that only played in a forward position. Forwards that played multiple positions were excluded and data was obtained from FBref.com. Being one of the largest historical databases for soccer-related statistics, the database was selected because of how useful it was for making comparisons across time and tracking trends in performance. In this case, performance was measured by goals scored over the entirety of a player's career, which varied among players. FBref.com was also selected because the database sources its data from reliable and well-established sources, such as official league statistics. This ensured that the data collected on forwards was accurate and up to date.

To collect information on forwards from FBRef.com, the R programming language was used. The process started with writing a code that pulled out all the URL links to player profiles in the Premier League from the 2000-2001 season to the present. The code then filtered the collected URL links based on the player's position and repeated the process to cover all forwards. The player profile links for forwards had to be collected because they contained tables that provided data on various variables observed throughout each player's career. Lastly, another code was written to collect data on numerous variables for each forward. It was then cycled to collect data for all of them. After all the data for each forward was collected, the data was merged into one extensive database in Excel. Ultimately, this became the dataset utilized for this study.

A total of 559 players in a forward position were included in the data collection, covering the 2000-2001 to 2022-2023 seasons. The dataset of all forward players contained information on a forward's age, the number of goals scored, tenure, experience, and the number of minutes played. Player, team-season, and year fixed effects models were also included in the final regression. Including all of these variables allowed me to examine the effect of a player's age on the number of goals that they were able to score.

**Figure 1: Summary Statistics on Age, Tenure, Experience, and Goals**

<b>Variable</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>Minimum</b>	<b>Maximum</b>
<b>Age</b>	25.43	4.95	17	36
<b>Tenure</b>	1.96	1.46	1	16
<b>Goals</b>	5.78	6.09	0	43
<b>Experience</b>	7.07	4.31	1	24

After further analyzing the summary statistics, several noteworthy observations were made. Age-wise, the youngest and oldest forwards observed were 17 and 36. The average age of all forwards was 25.43 with a standard deviation of 4.95. In terms of tenure, the shortest duration a player stayed with a team was one year, while the longest was 16 years. The mean tenure of all forwards was 1.96 with a standard deviation of 1.46. As for goals, the minimum number of goals scored by a player in a season was zero, while the maximum was 43. On average, the forwards scored 5.78 goals, with a standard deviation of 6.09. With regards to professional experience, the least amount of experience a player had was a year, while the maximum was 24 years. The mean experience was found to be 7.07 with a standard deviation of 4.31.

## Methodology

It is hypothesized that forwards will gradually improve when they are younger until they reach the age of their peak performance, after which they will gradually begin to decline. To estimate the effect of age on soccer players performance, I estimate the following between a forward's performance and all other independent variables:

$$Performance_{ijt} = \beta_0 + \beta_1 agecat_i + \beta_3 exp_{it} + \beta_4 tenure_{ij} + \psi_{jt} + \varphi_i + \theta_t + \varepsilon_{ijt}$$

Where the dependent variable  $Performance_{ijt}$  represents the performance measure of player  $i$  in team  $j$  during year  $t$ . To measure performance, I use goals and matches played.  $\psi_{jt}$  represents a team-season fixed effects,  $\varphi_i$  represents a player's fixed effects,  $\theta_t$  represents a year effects models and  $\varepsilon_{ijt}$  is used to represent error terms. The following fixed effect models are important to include in the equation as they will remove omitted variable bias that could result from measuring changes across groups in time.

For player  $i$ ,  $agecat_i$  reflects the main variable of interest, which is the age of a player in a forward position. It is composed of dummy variables of all age categories and the coefficients on the variables will allow us to track performance over time. The variable  $exp_{it}$  represents the experience of a player regarding how many years they have played professionally. Accounting for this variable is important as a player with more years of professional experience could explain their ability to score more goals than players with less experience. The final variable  $tenure_{ij}$  reflects the number of years a player has played in the same team. This is important to measure as a forward's comfortability with a team could affect their ability to score. If a player has been in a

team for a longer period, they may be more adjusted to the team's play style and feel more comfortable communicating with their teammates than a recently transferred player.

## Results

Among the 559 players that were observed in the study, it was found that players peak at the age of 25 in terms of matches played. At 25, the results show that forwards played a total of 13.99 more matches than the default category. In terms of goals scored, I found that players peaked at the age of 28, with the results showing that forwards scored a total of 10.13 more goals than the default category. For both performance variables that were measured, the default category consisted of forwards that were 17 years old. At  $p < 0.001$  for both performance variables, the results are highly significant as there's less than one in a thousand chance of them being incorrect.

It was found that the Adjusted R-Squared for matches played and goals scored were 0.251 and 0.275. For matches played and goals scored, the low Adjusted R-Squared suggests that the regression model is not a good fit, suggesting that the regression model is a poor model of the data.

**Figure 2: Results on Matches Played and Goals Scored**

Variable	Matches Played	Goals
Agecat 18	2.867* (1.165)	1.42* (0.588)
Agecat 19	6.253*** (1.375)	3.119*** (0.692)
Agecat 20	8.625*** (1.686)	4.62*** (0.846)
Agecat 21	11.15*** (2.032)	6.082*** (1.018)
Agecat 22	12.27***	7.299***



	(2.429)	(1.215)
<b>Agecat 23</b>	<b>13.07***</b>	<b>8.542***</b>
	(2.825)	(1.412)
<b>Agecat 24</b>	<b>12.39***</b>	<b>8.501***</b>
	(3.231)	(1.615)
<b>Agecat 25</b>	<b>13.99***</b>	<b>9.874***</b>
	(3.651)	(1.824)
<b>Agecat 26</b>	<b>12.29**</b>	<b>9.404***</b>
	(4.068)	(2.032)
<b>Agecat 27</b>	<b>11.69**</b>	<b>9.822***</b>
	(4.499)	(2.247)
<b>Agecat 28</b>	<b>11.53*</b>	<b>10.13***</b>
	(4.921)	(2.458)
<b>Agecat 29</b>	<b>11.03*</b>	<b>9.811***</b>
	(5.352)	2.673
<b>Agecat 30</b>	<b>8.92</b>	<b>9.828***</b>
	(5.782)	(2.887)
<b>Agecat 31</b>	<b>9.966</b>	<b>9.8**</b>
	(6.215)	(3.103)
<b>Agecat 32</b>	<b>9.504</b>	<b>9.832**</b>
	(6.638)	(3.315)
<b>Agecat 33</b>	<b>8.62</b>	<b>9.817**</b>
	(7.072)	3.531
<b>Agecat 34</b>	<b>8.273</b>	<b>9.928**</b>
	(7.520)	(3.755)
<b>Agecat 35</b>	<b>7.527</b>	<b>9.47*</b>
	(7.980)	(3.984)
<b>Agecat 36</b>	<b>7.943</b>	<b>9.382*</b>
	(8.452)	(4.220)
<b>Tenure</b>	<b>0.653***</b>	<b>0.409***</b>
	(0.105)	(0.052)
<b>Experience</b>	<b>-1.493***</b>	<b>-0.831***</b>
	(0.321)	(0.160)
<b>Seasons Fixed Effects</b>	Yes	Yes
<b>Teams Fixed Effects</b>	Yes	Yes
<b>Individual Fixed Effects</b>	Yes	Yes
<b>Adjusted R-Squared</b>	<b>0.251</b>	<b>0.275</b>

## Limitations

One of the limitations of the study is that it excluded forwards who played multiple positions, such as midfielder. As a result of this exclusion, data was collected for significantly less players. Among some of the players who were excluded from the data were Ryan Giggs, Heung-Min Son, and Mohamed Salah. It's important to note the exclusion of these forwards, as they are considered outliers due to being exceptionally high performers within the Premier League.

Secondly, the data set only covered forwards who had played in the Premier league at some stage in their careers, thereby omitting players who had never competed in the Premier League. Lionel Messi and Kylian Mbappe, who rank among the best forwards in the world and arguably history were among some of the notable players excluded from the data set, as they have exclusively played in the Spanish and French Leagues.

A further limitation of this study is that it only considers two performance variables: goals scored, and matches played. Other key indicators of player performance, like pass completion rate, one on one challenges completed, assists, number of shots on target, and total number of shots, were not considered. This is particularly relevant when assessing the performance of players in a forward position. Including these other variables could have given a more complete picture of how well these players were performing on the field.

Finally, the data only covers players during from the 2000-2001 to 2022-2023 seasons. Although the time frame covers more than two decades of data, it fails to account for the data of any forwards who played during the 20<sup>th</sup> century.

## Conclusion

The topic of the age of peak performance across soccer players has been a subject of heated debate in the soccer world for many years. In my analysis, I discovered that forwards peaked at 25 in terms of matches played and at 28 in terms of goals scored. In interpreting these results, it is important to consider that as players get older, their physical performance begins to decline. However, declining physical performance is not always correlated with a decline in technical performance. This could potentially explain why forwards peaked at a younger age in terms of matches played compared to when they peaked in terms of goals scored at an older age.

The results of this paper are important because they provide important metrics regarding when players perform at their best in terms of physical and technical performance. Using these metrics as a reference point, managers can optimize when and when not to purchase a player for their squad. Managers can also optimize generating revenue from player sales, as these metrics could be useful towards understanding when a player will attain their maximum potential. By understanding when players achieve their potential, managers can determine when players will achieve their highest valuation. This is because there's a strong correlation between individual player performance and their valuation on the transfer market.

To expand upon this investigation, researchers could determine the age at which players in different positions reach their peak performance. Researchers could achieve this by determining the peak age of performance based on a universal performance measure such as the number of matches played, and then comparing the peak ages across different positions. Furthermore, researchers could include additional leagues and analyze data over a larger time frame or a

different time frame altogether. If researchers chose to investigate the latter, it would be intriguing to compare when and why players peaked in terms of these performance variables.

In conclusion, this study suggests that forwards peak at a younger age in terms of matches played than in terms of goals scored. Additional research about the age of peak performance across forwards in the Premier League is important to build upon the results of this paper.

## References

- Bach, G. (2017, April 10). *Mistakes: They Should Refine-Not Define-Young Players*. National Alliance for Youth Sports. Retrieved March 17, 2022, from <https://www.nays.org/sklive/for-coaches/mistakes-they-should-refine-not-define-young-players/>
- Clayfield, B. (2020, January 20). How many games in a soccer season? Retrieved March 24, 2022, from <https://yoursoccerhome.com/how-many-games-in-a-soccer-season/>
- Cohn, P. (2019, June 3). *Peak performance in sports: Sports psychology articles*. Sports Psychology Articles | Sport Psychology Articles for Athletes, Coaches, and Sports Parents. Retrieved March 17, 2022, from <https://www.peaksports.com/sports-psychology-blog/peak-performance/>
- Csukonyi, C. (2012). *Introduction to sport psychology*. 4. Psychological Features Of Peak Performance. Retrieved March 17, 2022, from [https://psycho.unideb.hu/sport/fejezetek/cscs\\_angol\\_itsp/\\_book/psychological-features-of-peak-performance.html](https://psycho.unideb.hu/sport/fejezetek/cscs_angol_itsp/_book/psychological-features-of-peak-performance.html)
- Dendir, S. (2016, January 1). *When Do Soccer Players Peak? A Note*. Journal of Sports Analytics. Retrieved March 17, 2022, from <https://content.iospress.com/articles/journal-of-sports-analytics/jsa0021>
- Farias, V. M., Bergmann, G. G., Texeira, L. M., & Pinheiro, E. dos S. (2018). *Goal Scoring Frequency in Soccer in Different Age Groups*. Retrieved March 17, 2022, from [https://www.researchgate.net/profile/Eraldo-Pinheiro/publication/332456950\\_Artigo\\_Original\\_Goal\\_scoring\\_frequency\\_in\\_soccer\\_in\\_different\\_age\\_groups/links/5cb675ff299bf120976ab385/Artigo-Original-Goal-scoring-frequency-in-soccer-in-different-age-groups.pdf](https://www.researchgate.net/profile/Eraldo-Pinheiro/publication/332456950_Artigo_Original_Goal_scoring_frequency_in_soccer_in_different_age_groups/links/5cb675ff299bf120976ab385/Artigo-Original-Goal-scoring-frequency-in-soccer-in-different-age-groups.pdf)
- Jamil, M., & Kerruish, S. (2020, October 20). *At What Age Are English Premier League*

- Players at Their Most Productive? A Case Study Investigating the Peak Performance Years of Elite Professional Footballers.* Taylor & Francis. Retrieved March 17, 2022, from <https://www.tandfonline.com/doi/abs/10.1080/24748668.2020.1833625>
- Kalén, A., Rey, E., de Rellán-Guerra, A. S., & Lago-Peñas, C. (1AD, January 1). *Are soccer players older now than before? aging trends and market value in the last three decades of the UEFA champions league.* Frontiers. Retrieved March 17, 2022, from <https://www.frontiersin.org/articles/10.3389/fpsyg.2019.00076/full>
- Laude, O., Koch, T., & Meyer, T. (2012, March). *Straight Sprinting is The Most Frequent Action in Goal Situations in Professional Football.* Retrieved March 17, 2022, from [https://www.researchgate.net/publication/221681262\\_Straight\\_sprinting\\_is\\_the\\_most\\_frequent\\_action\\_in\\_goal\\_situations\\_in\\_professional\\_football](https://www.researchgate.net/publication/221681262_Straight_sprinting_is_the_most_frequent_action_in_goal_situations_in_professional_football)
- Lorenzo-Martínez, M. (2019, October 20). *The Effect of Age on Between-Match Physical Performance Variability in Professional Soccer Players.* Taylor & Francis. Retrieved March 17, 2022, from <https://www.tandfonline.com/doi/abs/10.1080/15438627.2019.1680985>
- Rey, E., Costa, P. B., Corredoira, F. J., & Rellán-Guerra, S. D. (2019, July 1). *Effects of Age on Physical Match Performance in Professional Soccer Players.* Retrieved March 17, 2022, from <https://europepmc.org/article/med/31268996>
- Sal de Rellán-Guerra, A., Rey, E., Kalén, A., & Lago-Peñas, C. (2019, May 17). *Age-Related Physical and Technical Match Performance Changes in Elite Soccer Players.* Wiley Online Library. Retrieved March 17, 2022, from <https://onlinelibrary.wiley.com/doi/abs/10.1111/sms.13463>
- Schumacher, N., Schmidt, M., Wellmann, K., & Braumann, K.-M. (2018, August 23). *General Perceptual-Cognitive Abilities: Age and Position in Soccer.* PLOS ONE. Retrieved March 17, 2022, from <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0202627>
- Simiyu, W. W. N. (2013, March 3). *Analysis of Goals Scored in the 2010 World Cup Soccer Tournament Held in South Africa.* ScholarWorks at UT Tyler. Retrieved March 17, 2022, from [https://scholarworks.uttyler.edu/hkdept\\_fac/7/](https://scholarworks.uttyler.edu/hkdept_fac/7/)