How does age affect performance among NFL players?

•Do NFL players improve, peak, or decline as they age?
•Does the age–performance curve differ by position (e.g., quarterbacks vs. running backs vs. defensive players)?

Hypothesis:
- NFL players will show a curved age performance trajectory, with rapid improvement at younger ages, a peak, and then a decline.
- Positions more dependent on physical speed (RB, WR, CB) will peak earlier than experience-based positions (QB, OL).
- Running backs and defensive backs will decline faster than quarterbacks and offensive linemen due to higher physical wear.
- Older NFL players who remain in the league will perform above what their age curve predicts, because weaker players have retired. (Delta method bias)

Data Source

I will use data from Pro-Fotball-Reference and extract:
- Player age (age as of season)
- Position
- Yearly performance statistics (e.g., yards, touchdowns, tackles, sacks)
- Snap counts and games played

Typical variables:
- QB: Pass yards, TDs, passer rating, EPA/CPOE (if available)
- RB: Rush yards, yards per attempt, touches
- WR/TE: Targets, receptions, yards, yards per route
- Defensive players: Tackles, sacks, interceptions
- Overall: Approximate Value (AV) — a good summary metric from PFR

Sample Size: Thousands of player-seasons across many years.

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The Aging Curve: How Age Affects Physical Performance in Elite Football

[Luís Branquinho](#) [1,2,3,4], [Elias de França](#) [5,6,7,*], [Adriano Titton](#) [7,8], [Luís Fernando Leite de Barros](#) [7], [Pedro Campos](#) [7], [Felipe O Marques](#) [7], [Igor Phillip dos Santos Glória](#) [7], [Erico Chagas Caperuto](#) [6], [Vinicius Barroso Hirota](#) [9], [José E](#)

Does Relative Age Affect Career Length in North American Professional Sports?

Estimated Age Effects in Baseball

Ray C. Fair*

Updated April 2025

Methodology

- Sample selection : QB (minimum 8 starts), RB/WR(100 touches/50 targets), 5 or more full time seasons

- Performance Measures: QB Rating, EPA/play, WR Yards/Route, RB Yards/Touch

- Model
  - Yit = performance of player i at age t, Xit = age, S = unknown peak

For ages ≤ δ:

$$y_{it} = \alpha_i + \beta_1 x_{it} + \gamma_1 x_{it}^2 + \varepsilon_{it}$$

For ages ≥ δ:

$$y_{it} = \alpha_i + \beta_2 x_{it} + \gamma_2 x_{it}^2 + \varepsilon_{it}$$