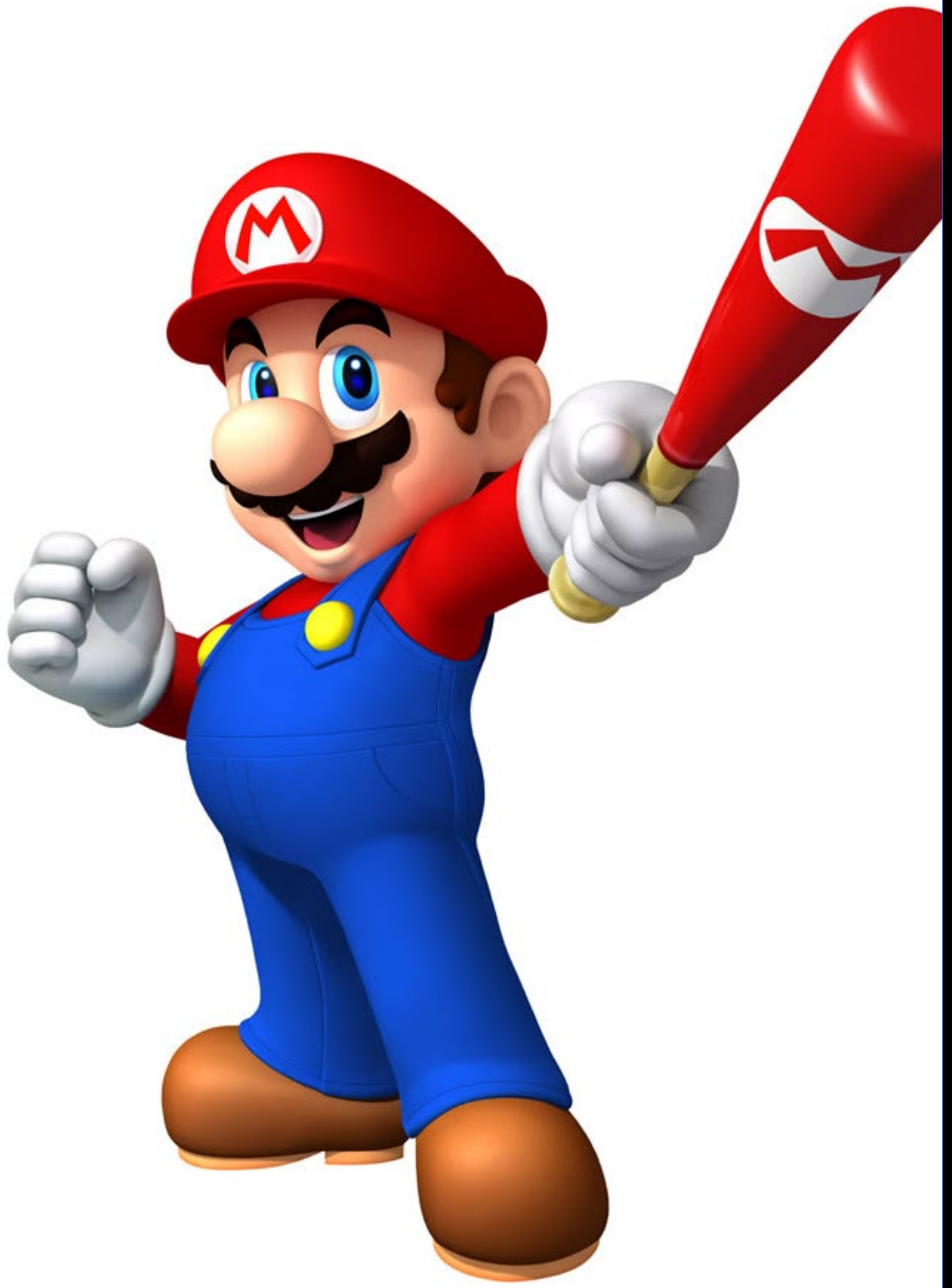
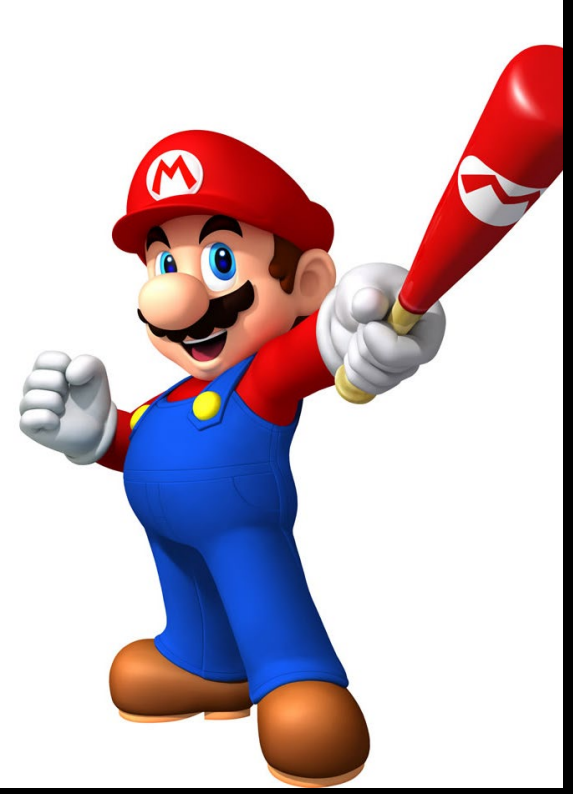


Baseball VI

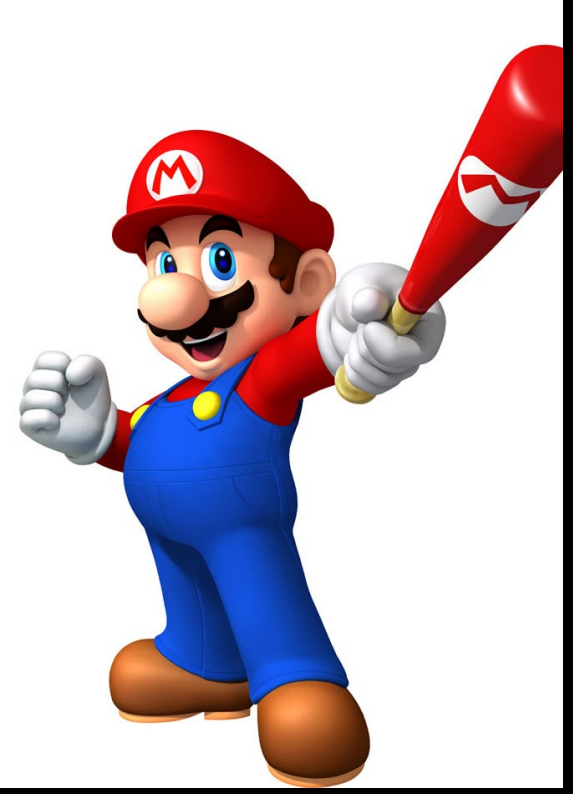
Produced by Dr. Mario | UNC STOR 538



Win Probability Added

- Motivation:
  - 1951 Playoffs
  - New York Giants (H) Versus Brooklyn Dodgers (A)
  - Situation:
    - 9th inning
    - Giants Losing By Two Runs
    - Runners on Second and Third
    - 1 Out
  - Currently, Giants Have 27% Chance to Win
  - Bobby Thomson HR to Win Game Against Ralph Branca
  - Now, the Giants Have 100% Chance to Win Game

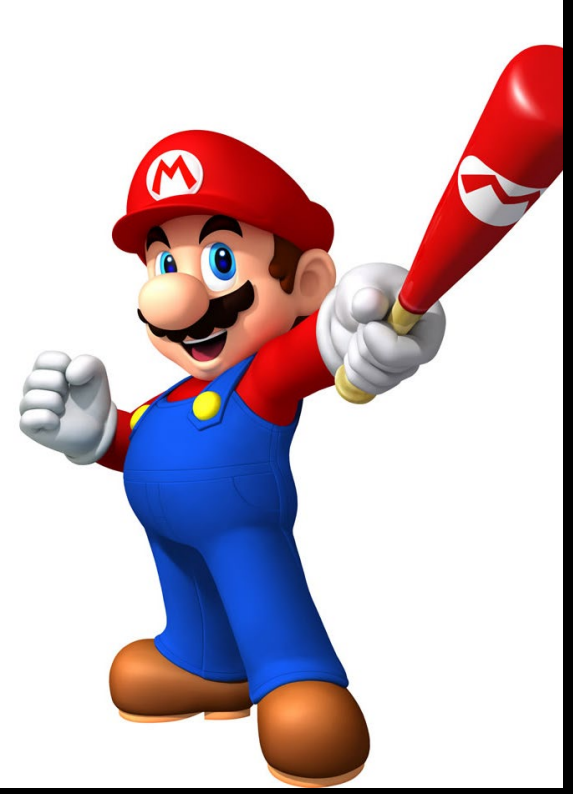
- Goal: Measure an Athlete's Ability to Help Team Win



Win Probability Added

- Win Probability Added (WPA)
  - Based off Scenario:
    - Thomson's WPA: 1-0.27 = 0.73
    - Branca's WPA: 0-0.73 = -0.73
  - WPA of a Player is a Difference Between
    - Win Probability After
    - Win Probability Before
  - WPA Changes for Every Plate Appearance
  - Any Problems in This? Imagine Thomson Got an In-the-Park HR

Rating	WPA
Excellent	+6.0
Great	+3.0
Above Average	+2.0
Average	+1.0
Below Average	0.0
Poor	−1.0
Awful	−3.0



Win Probability Added

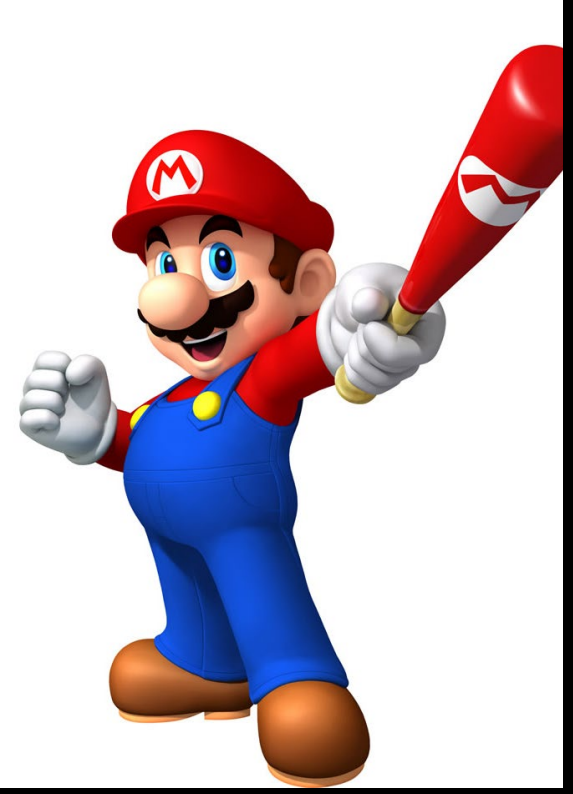
- FanGraphs Calculation of WPA in 2019

Name	Team	WPA
Christian Yelich	Brewers	7.34
Cody Bellinger	Dodgers	5.41
Mike Trout	Angels	5.17
Anthony Rendon	Nationals	4.95
Matt Olson	Athletics	4.82
Max Muncy	Dodgers	4.82
Bryce Harper	Phillies	4.71
Freddie Freeman	Braves	4.65
Anthony Rizzo	Cubs	4.54
Ronald Acuna Jr.	Braves	4.5

Name	Team	WPA
Justin Verlander	Astros	5.19
Hyun-Jin Ryu	Dodgers	4.33
Gerrit Cole	Astros	4.31
Jacob deGrom	Mets	4.21
Jack Flaherty	Cardinals	3.97
Shane Bieber	Indians	3.82
Max Scherzer	Nationals	3.47
Mike Soroka	Braves	3.45
Charlie Morton	Rayes	3.4
Zach Greinke	---	3.36

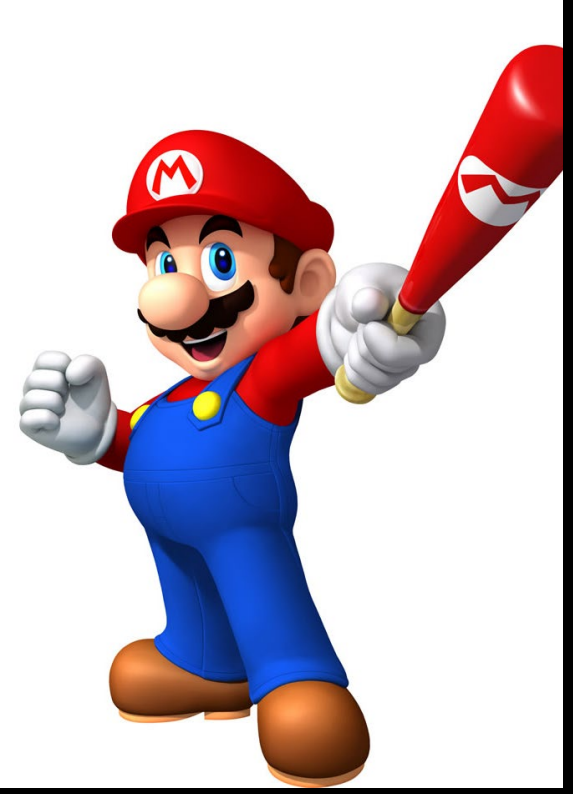
Can Be Interpreted in Games Added

- Relief Pitchers Benefit From This Metric



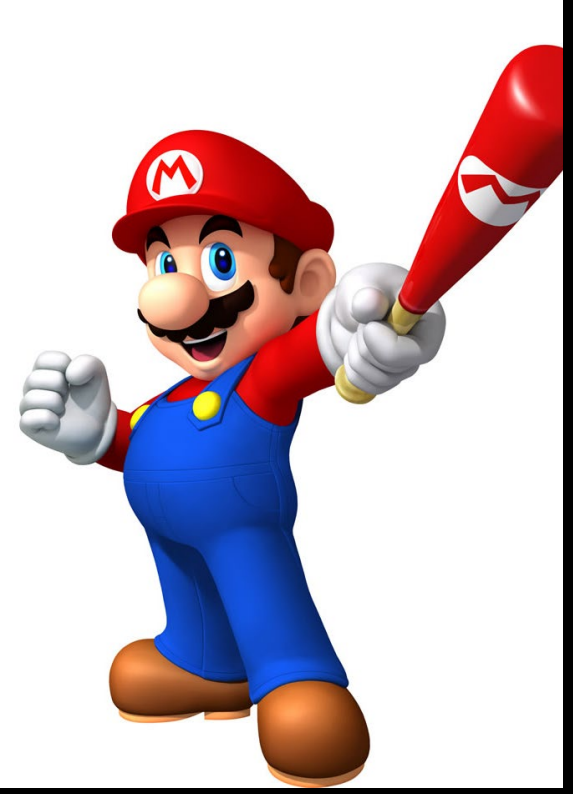
Win Probability Added

- Fielding Ratings Into WPA (Read Chapter 7)
  - Prerequisites:
    - Outs Above Average (OAA)
    - Runs Prevented
    - 10 Runs = 1 Win (Pythagorean Method)
  - Requirement: Convert Runs Prevented into Wins
  - Example: Cody Bellinger 2019
    - WPA = 5.41
    - Fielding Prevented 8 Runs Above Average (STATCAST)
    - WPA with Fielding $5.41 + \frac{8}{10} = 6.21$



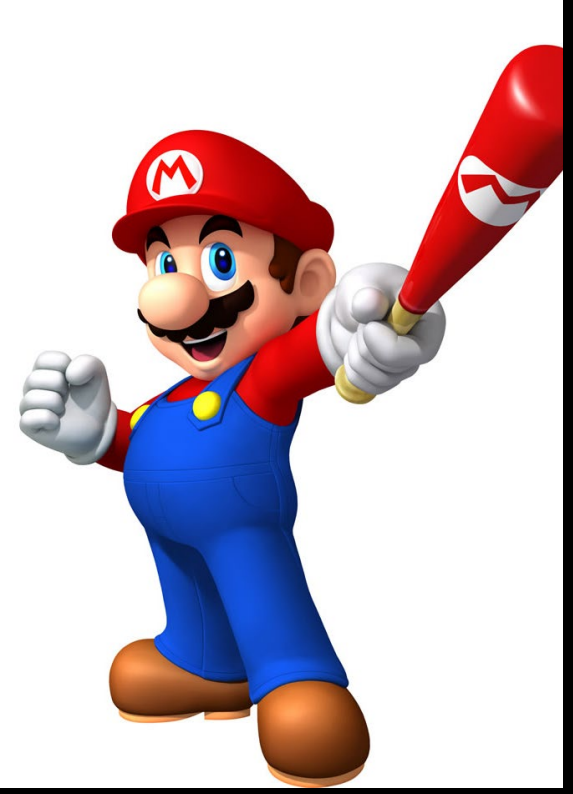
Win Probability Added

- Base Running Into WPA
  - Good Base Runner Described
    - Rarely Caught Stealing and Stealing Often
    - Rarely Caught in Double Plays
    - Able to Take Extra Bases
  - FanGraphs Metrics
    - Ultimate Base Running (UBR)
    - Weighted Stolen Bases (wSB)
    - Weighted Ground Into Double Play (wGDP)
    - All Three Measure Runs Added Relative to Average Player
  - Example: Billy Hamilton 2016
    - UBR = 4.1, wGDP = 0.6, wSB = 8.1
    - Baserunning Runs Added = 12.8 Runs
    - Add 1.28 Wins to WPA



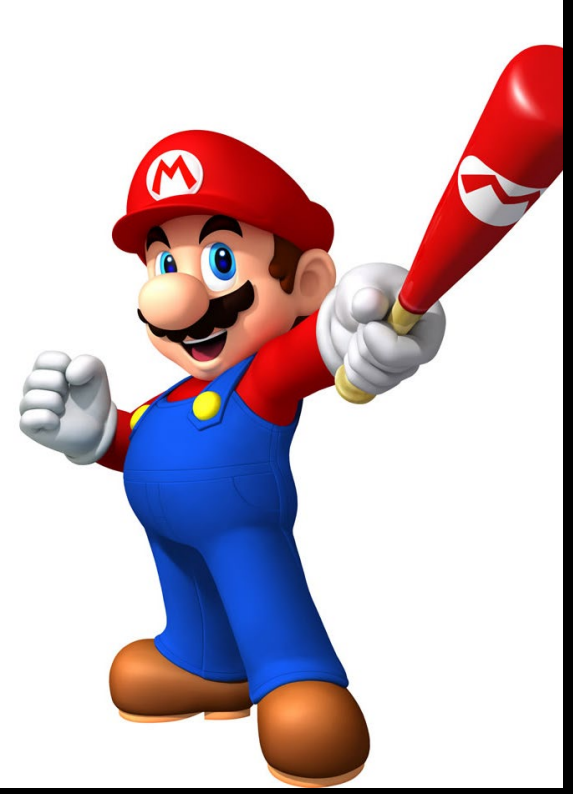
Wins Above Replacement

- Keith Woolner
  - Works for the Cleveland Guardians
  - Authored for *Baseball Prospectus*
  - Respected for Player Analysis and Market Evaluation
  - Created Value of Replacement Player (VORP)
- Replacement Player
  - Players Create Value by Keeping Bad Players Off the Field
  - Acquiring Replacement Players (Minor League)
  - Assume List of Replacement Players is Infinite
  - Woolner Defined Replacement Player as a Player in the Bottom 20% of List Ordered by Plate Appearances
  - Fan Graphs Definition
    - 20 Runs Below Average for a Season
    - Team of Replacement Players Win 48 Games Out of 162



Wins Above Replacement

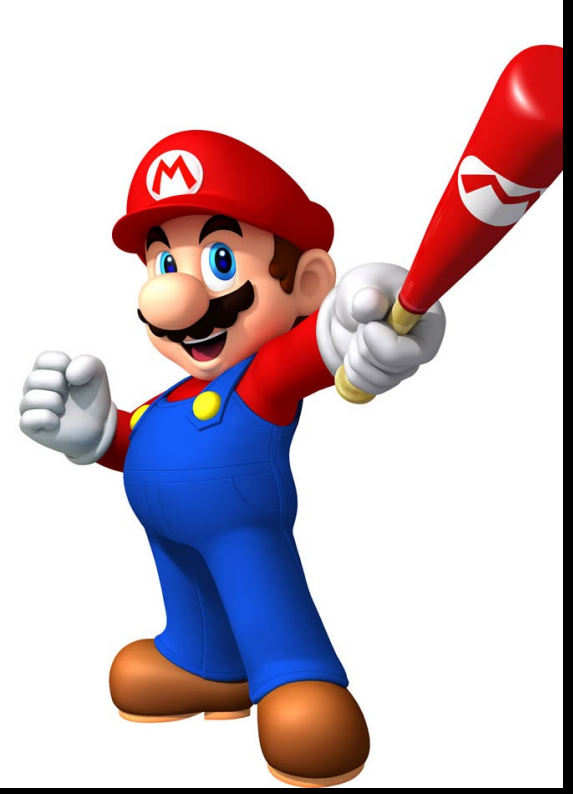
- Wins Above Replacement (WAR)
  - Attempt to Measure All of a Baseball's Player's Contributions
  - What is it good for? Absolutely Everything
  - Not Comparing to Average Player but Replacement Player
  - Interpretation: "If a player got injured and their team had to replace them, how many wins would the team be losing?
- Three Main Sources of WAR
  - Baseball-Reference (bWAR)
  - FanGraphs (fWAR)
  - Baseball Prospectus (WARP)
- Carefully Read Steps for Calculation of WAR in Textbook



Wins Above Replacement

- Formula Differs for Position Players and Pitchers
  - Position Players: Batting, Baserunning, and Fielding Measured in Runs Above Average (RAA)
  - Pitchers: Either Based on Runs Allowed Per 9 Innings (RA9) or Fielding Independent Pitching (FIP)
- General Formula for Position Players (fWAR)

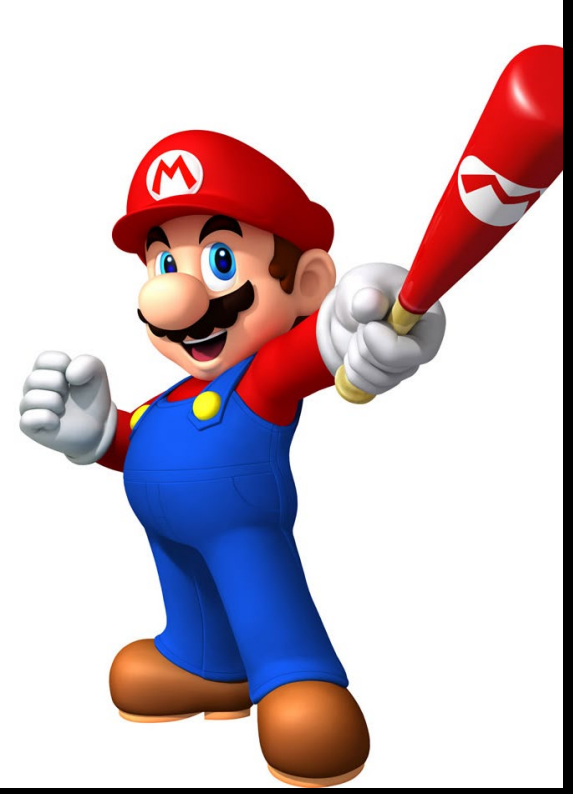
$$WAR = (Batting\ Runs + Base\ Running\ Runs + Fielding\ Runs + Positional\ Adjustment + League\ Adjustment + Replacement\ Runs) / (Runs\ Per\ Win)$$



Wins Above Replacement

- Top Players for bWAR Based on Career

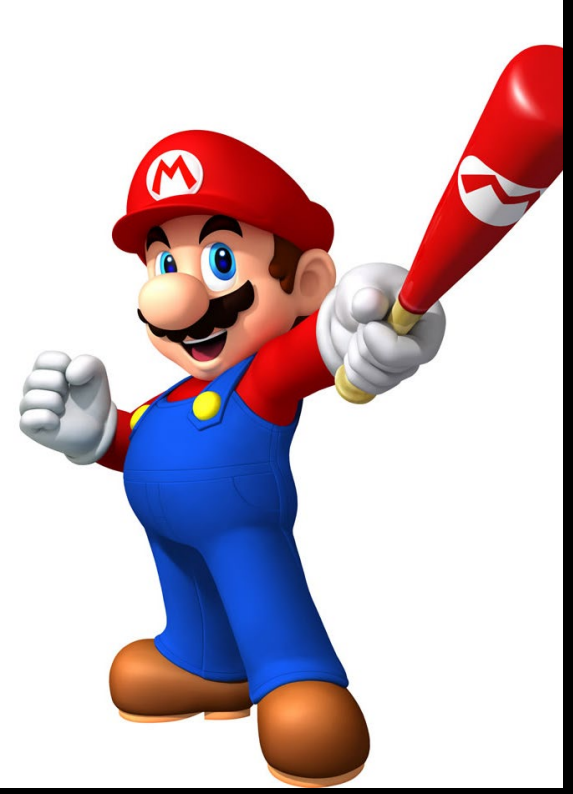
Rank	Player (yrs, age)	WAR Position Players	Bats
1.	Barry Bonds (22)	162.8	L
2.	Babe Ruth+ (22)	162.1	L
3.	Willie Mays+ (22)	156.4	R
4.	Ty Cobb+ (24)	151.0	L
5.	Hank Aaron+ (23)	143.0	R
6.	Tris Speaker+ (22)	134.1	L
7.	Honus Wagner+ (21)	130.8	R
8.	Stan Musial+ (22)	128.2	L
9.	Rogers Hornsby+ (23)	127.0	R
10.	Eddie Collins+ (25)	124.0	L



Wins Above Replacement

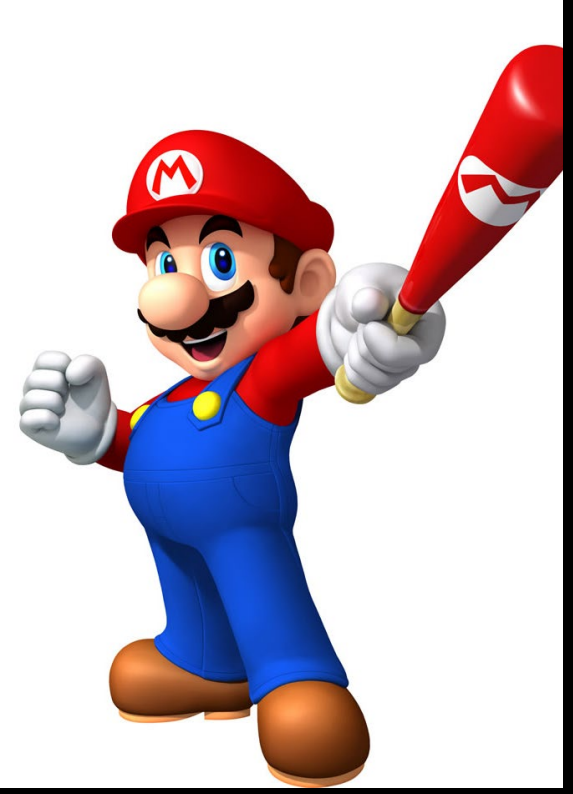
- **Top Players for fWAR Based on 2019 Season**

#	Name	Team	Pos	PA	IP	Primary WAR	Total WAR
1	Mike Trout	Angels	CF	600		8.6	8.6
2	Christian Yelich	Brewers	RF	580		7.7	7.7
3	Alex Bregman	Astros	3B/SS	643		7.4	7.4
4	Cody Bellinger	Dodgers	RF	621		7.2	7.2
5	Anthony Rendon	Nationals	3B	595		7.2	7.2
6	Ketel Marte	Diamondbacks	2B/CF	626		7.0	7.0
7	Jacob deGrom	Mets	P		190.0	6.2	6.9
8	Marcus Semien	Athletics	SS	698		6.8	6.8
9	Max Scherzer	Nationals	P		159.2	6.4	6.4
10	Gerrit Cole	Astros	P		192.1	6.5	6.4



Wins Above Replacement

- Using WAR to Determine Player Salaries
  - Prerequisites:
    - Teams Have 25 Players
    - Minimum Salary = $500,000
    - Team of Replacement Players Win 48 Games
    - Salary for Team of Replacement Players = $12.5 Million
    - Average Team Salary in 2016 = $114 Million
    - Average Team Wins 81 out of 162 Games
  - Cost of 81-48=33 Wins is $114 – $12.5 = $101.5 Million
  - Each Win Above Replacement is Worth $3.08 Million

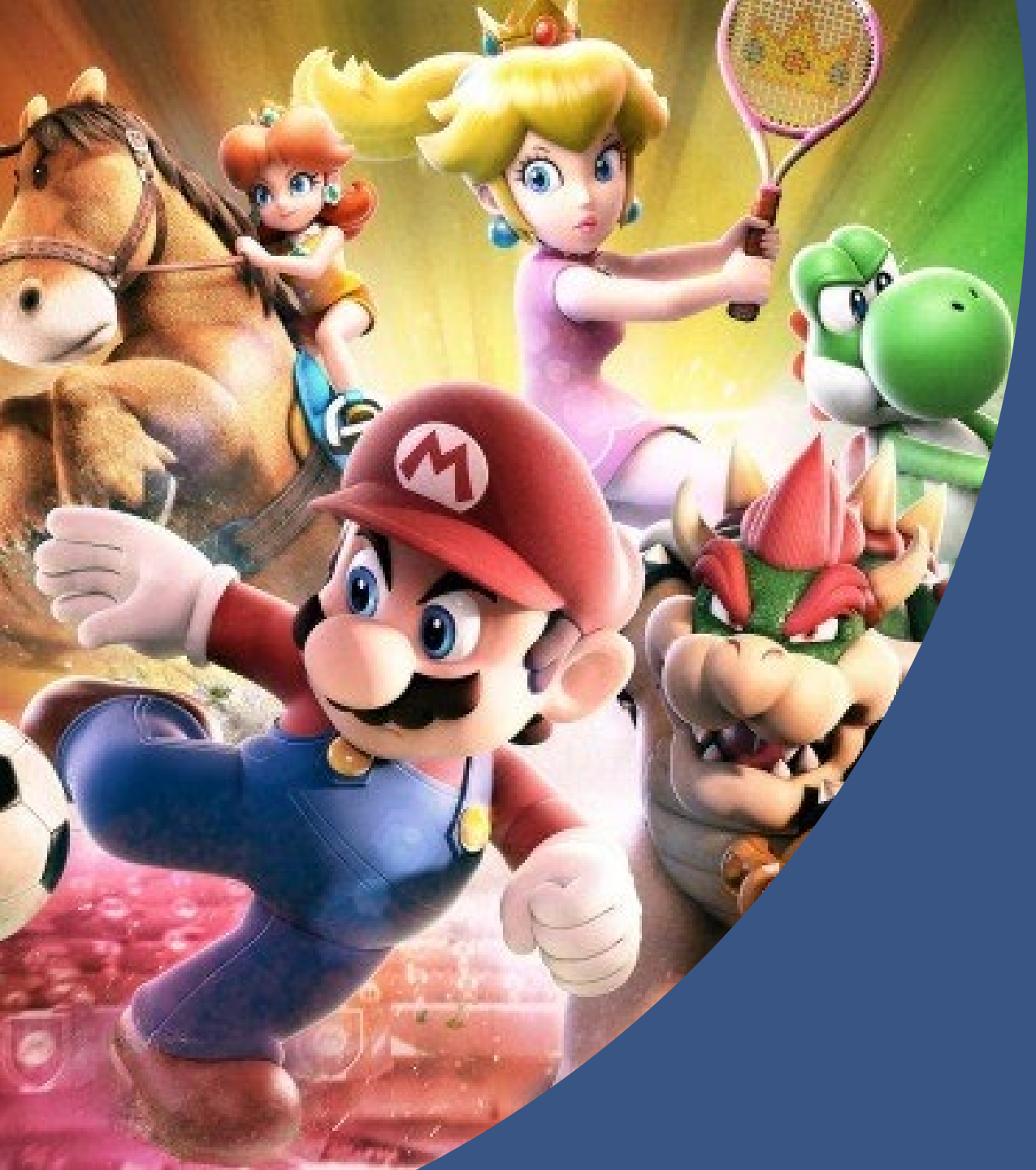


Wins Above Replacement

- Salary Comparison in 2016

Name	Team	WAR	Actual Salary	Fair Salary
Jon Lester	Cubs	4.3	$25.00	$13.24
Robinson Cano	Mariners	6	$24.00	$18.48
Adrian Beltre	Rangers	6.1	$18.00	$18.79
Mike Trout	Angels	9.4	$16.08	$28.95
Freddie Freeman	Braves	6.1	$12.36	$18.79
Josh Donaldson	Blue Jays	7.6	$11.65	$23.41
Manny Machado	Orioles	6.5	$5.00	$20.02
Jose Altuve	Astros	6.7	$3.69	$20.64
Adam Eaton	White Sox	6	$2.75	$18.48
Kris Bryant	Cubs	8.4	$0.70	$25.87
Mookie Betts	Red Sox	7.8	$0.60	$24.02
Corey Seager	Dodgers	7.5	$0.50	$23.10
Francisco Lindor	Indians	6.3	$0.50	$19.40

- Winner's Curse = Pay More Than Player is Worth



Final Inspiration

Yesterday’s home runs don’t win today’s games.

-Babe Ruth