Analyzing Spin Direction for Division 1 Softball

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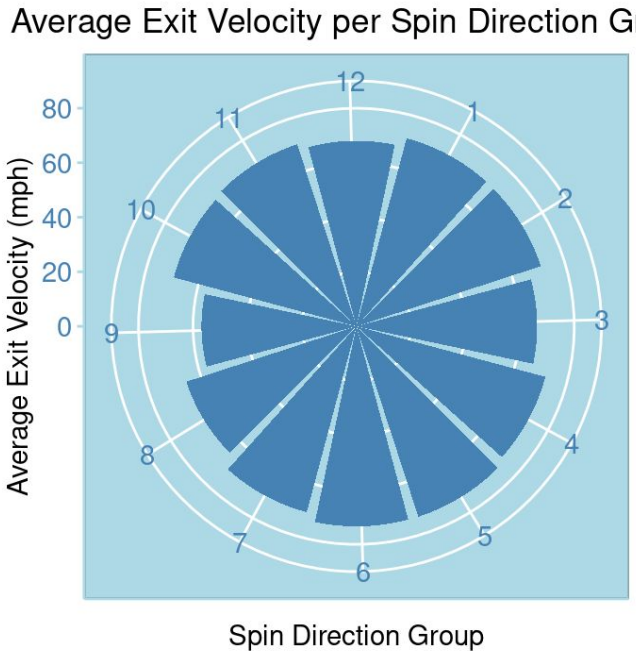
In-Practice Live Observations

- Observed ideal hitting zone
  - Right-Handed Hitters: 1:00
  - Left-Handed Hitters: 11:30

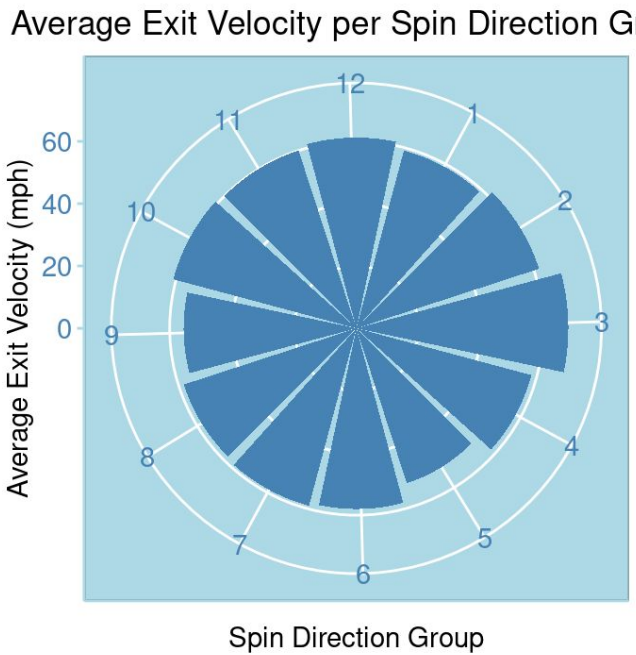
- Occasional incorrect and missing measurements from rapsodo

- Non-mirrored difference in ideal spin direction when comparing right-handed vs left-handed hitters

Spin Direction Summary Stats



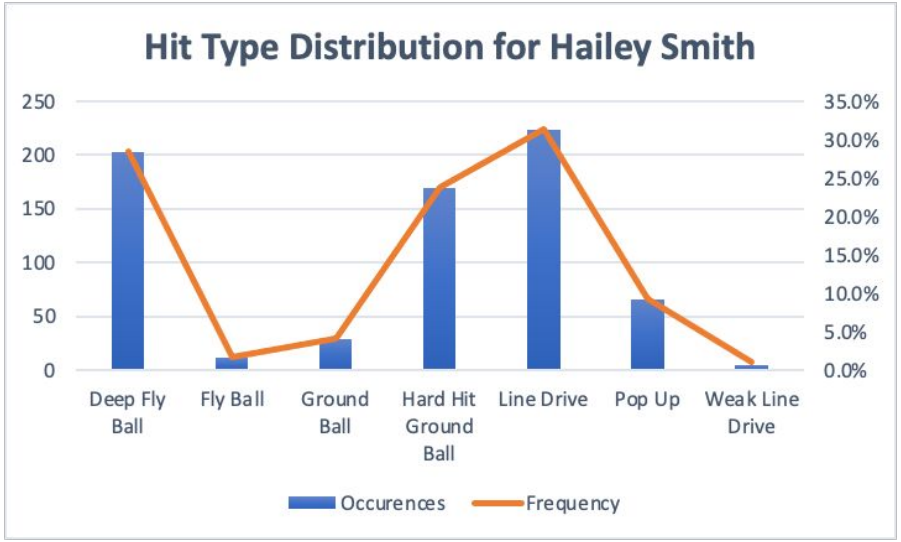
Hailey Smith



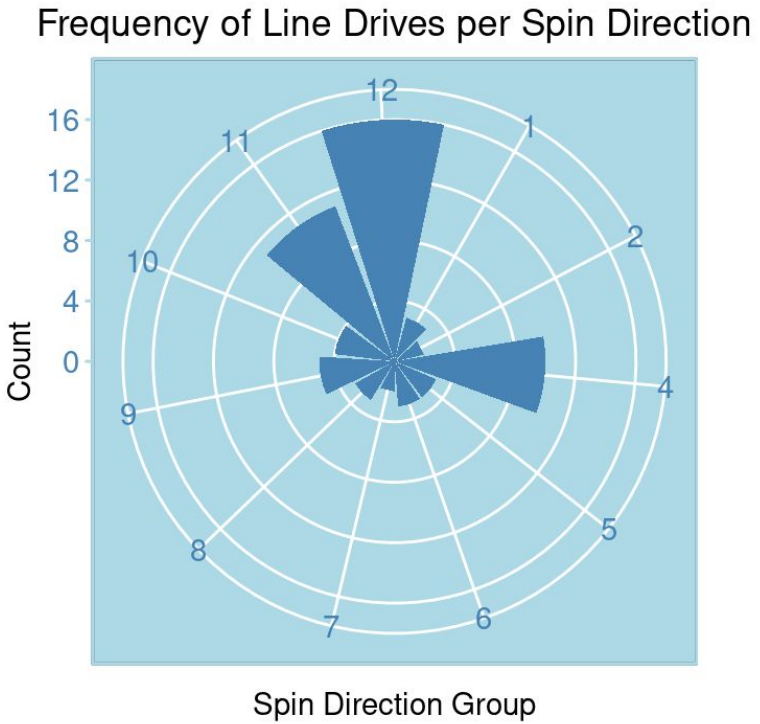
Ashley York

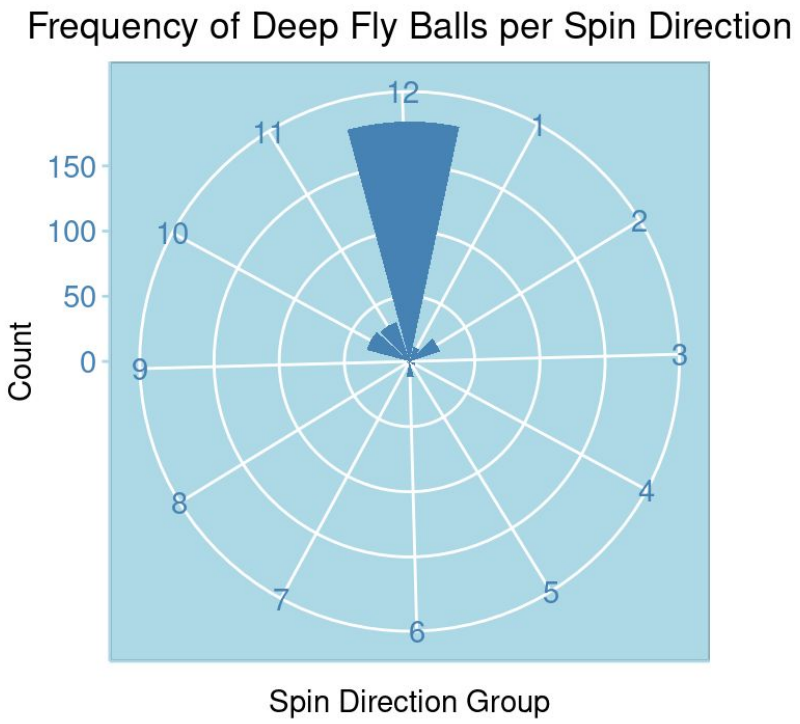
Analyzing Spin Direction Through Hit Types

- Possible Hit Types
  - Deep Fly Ball
  - Fly ball
  - Pop Up
  - Line Drive
  - Ground Ball
  - Hard Hit Ground Ball
- Defined by filtering combinations of launch angle, exit velocity, and distance

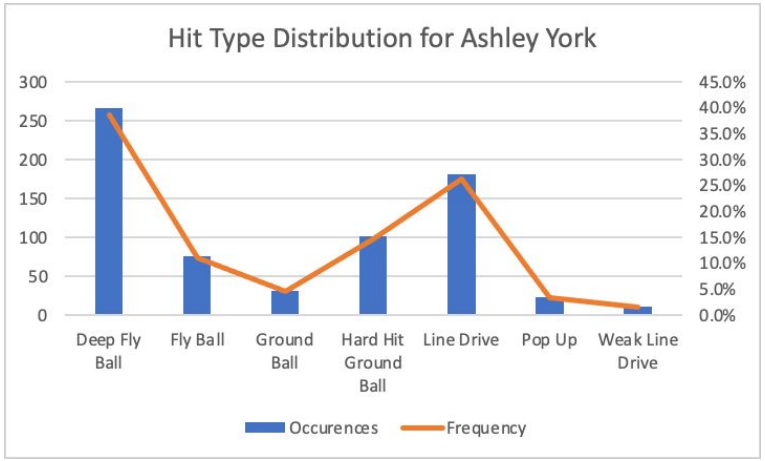


A Deeper Look at Lefties

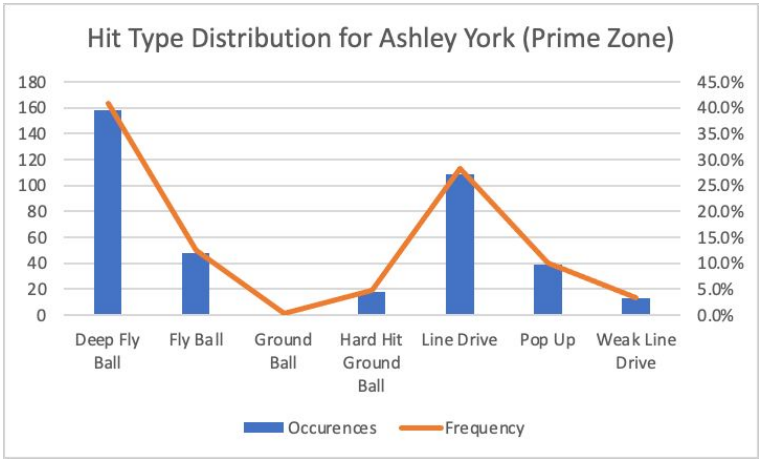




A Deeper Look at Lefties

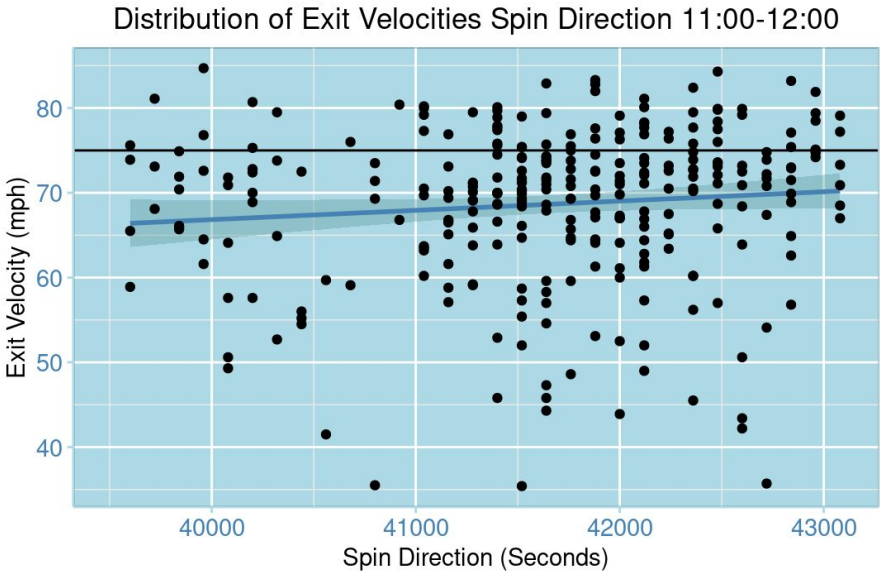


Overall Hit Type Distribution



Hit Type Distribution for Spin Direction Range (10:00 - 12:00

A Deeper Look at Lefties



- 69.1% of hits in this range represent an ideal outcome
  - Deep Fly Balls
    - 40.9%
  - Line Drives
    - 28.2%
- 308 out of 683 batted balls resulted in a spin direction of 11:00 - 12:00
  - 45% of results
- High frequency of upper quartile exit velocities
  - Marked on plot by horizontal line at 75 mph

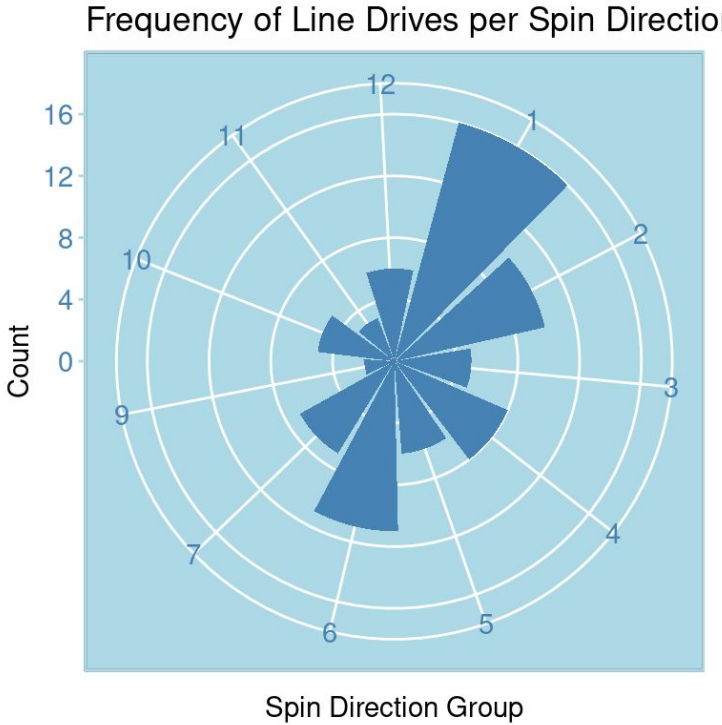
Further Subsetting

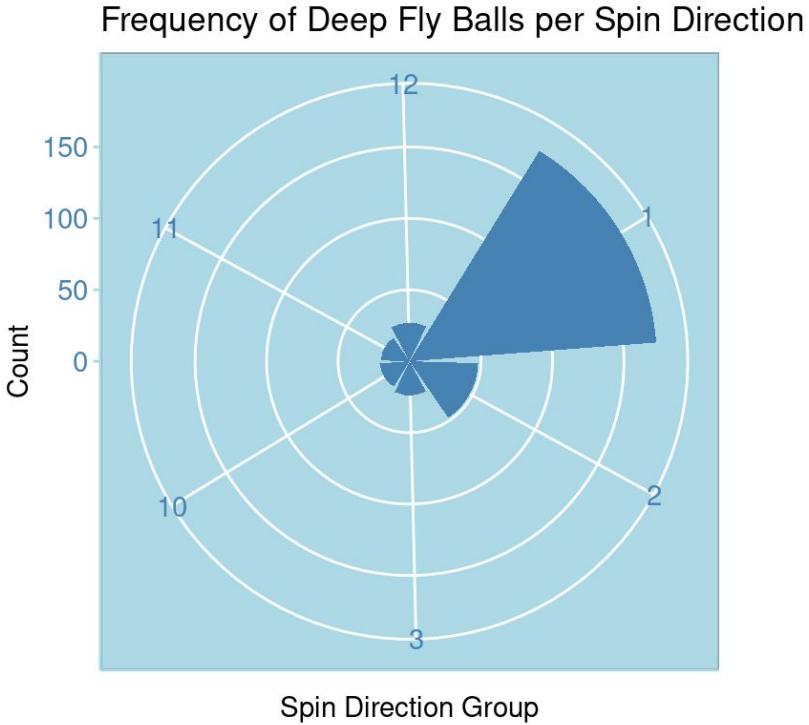
- Divided prime zone (11:00-12:00) into subdivisions to further analyze exit velocity and hit type frequencies

- Groups
  - 11:00-11:20 = Zone 1
  - 11:21-11:40 = Zone 2
  - 11:41- 12:00 = Zone 3

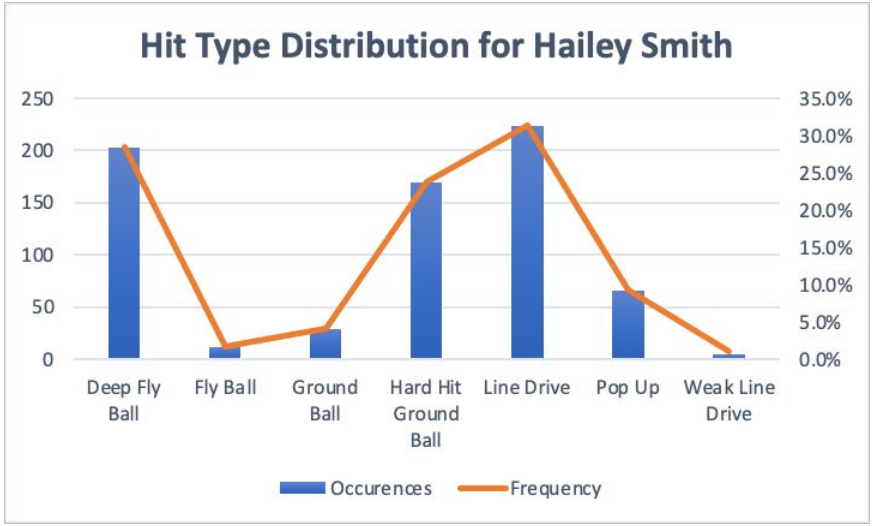
- Zone 2 is ideal Spin Direction for Left-Handed Hitters
  - Average Exit Velocity = 68.5
  - Proportion of Ideal Hit Types = 80%

A Deeper Look at Righties

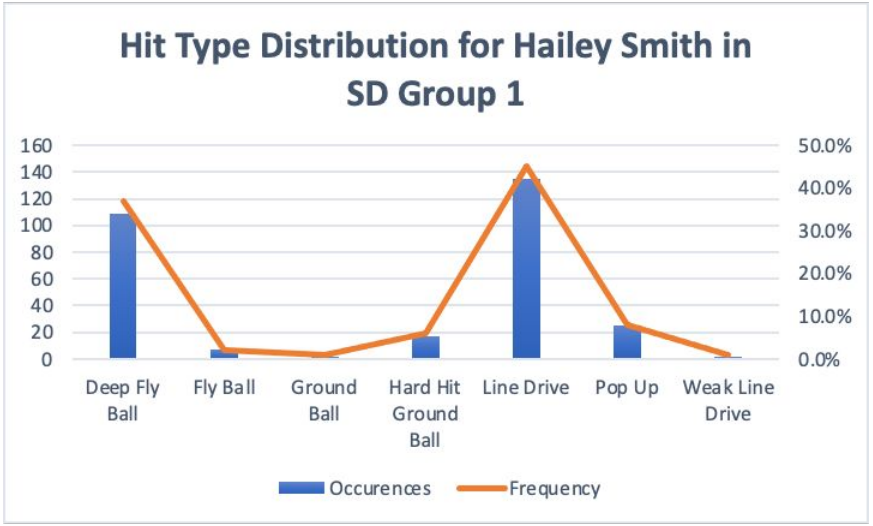




A Deeper Look at Righties



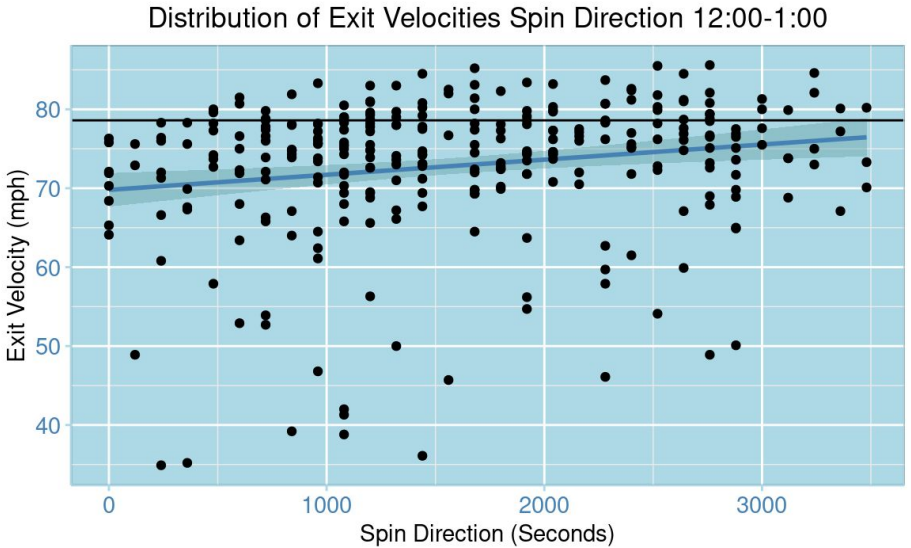
Overall Hit Type Distribution



Hit Type Distribution in Ideal Zone (12:00-1:00)

A Deeper Look at Righties

- 82% of hits in this range represent an ideal outcome
  - Deep Fly Balls
    - 37%
  - Line Drives
    - 45%
- 298 out of 711 batted balls resulted in a spin direction of 12:00 - 1:00
  - ~42% of results
- High frequency of upper quartile exit velocities
  - Marked on plot by horizontal line at 78.6 mph



Further Subsetting

- Divided prime zone (12:00-1:00) into subdivisions to further analyze exit velocity and hit type frequencies

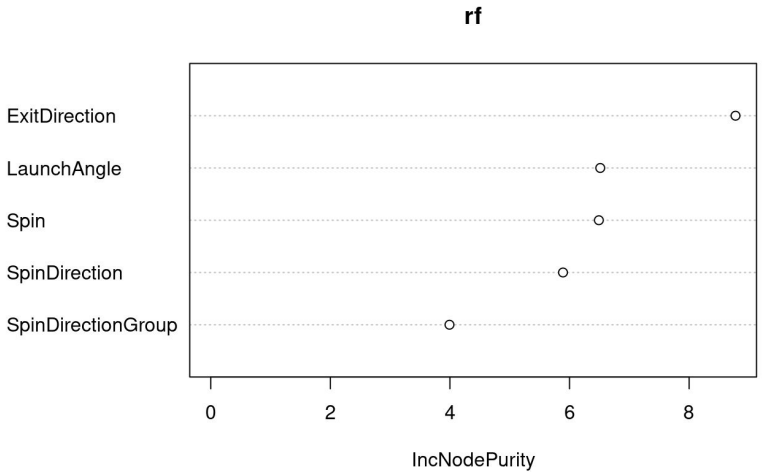
- Groups
  - 12:00-12:20 = Zone 1
  - 12:21-12:40 = Zone 2
  - 12:41- 1:00 = Zone 3

- Zone 2 is ideal Spin Direction for Right-Handed Hitters
  - Average Exit Velocity = 74.8
  - Proportion of Ideal Hit Types = 88%

Random Forest (Variable Importance)

- Predictors:
  - Spin Direction
  - Exit Direction
  - Spin
  - Spin Direction Group
  - Launch Angle
- Response:
  - Binary Variable representing 75th percentile and above Exit Velocities

- Spin Direction Group was moderately important
  - Likely due to noise in the data
  - Spin Direction was of greater importance



Random Forest (Results)

- Test RMSE of 0.08
  - Very strong prediction accuracy
- Spin Direction and Group were not the most useful predictors, which was a surprise

- Could be attributed to measurement error

- Sparked an interest to look into exit direction interaction with spin direction

Overall Conclusions

Ideal Spin Direction Range:

- Right Handed Hitters: ~12:40-1:00
- Left Handed Hitters: ~11:20-11:40