# R Workflows in Azure Machine Learning for Athletic Data Analysis

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# Data for High Performance Athletics

**Trying to keep athletes**

- Healthy
- Available
- Performing well

**Measured by**

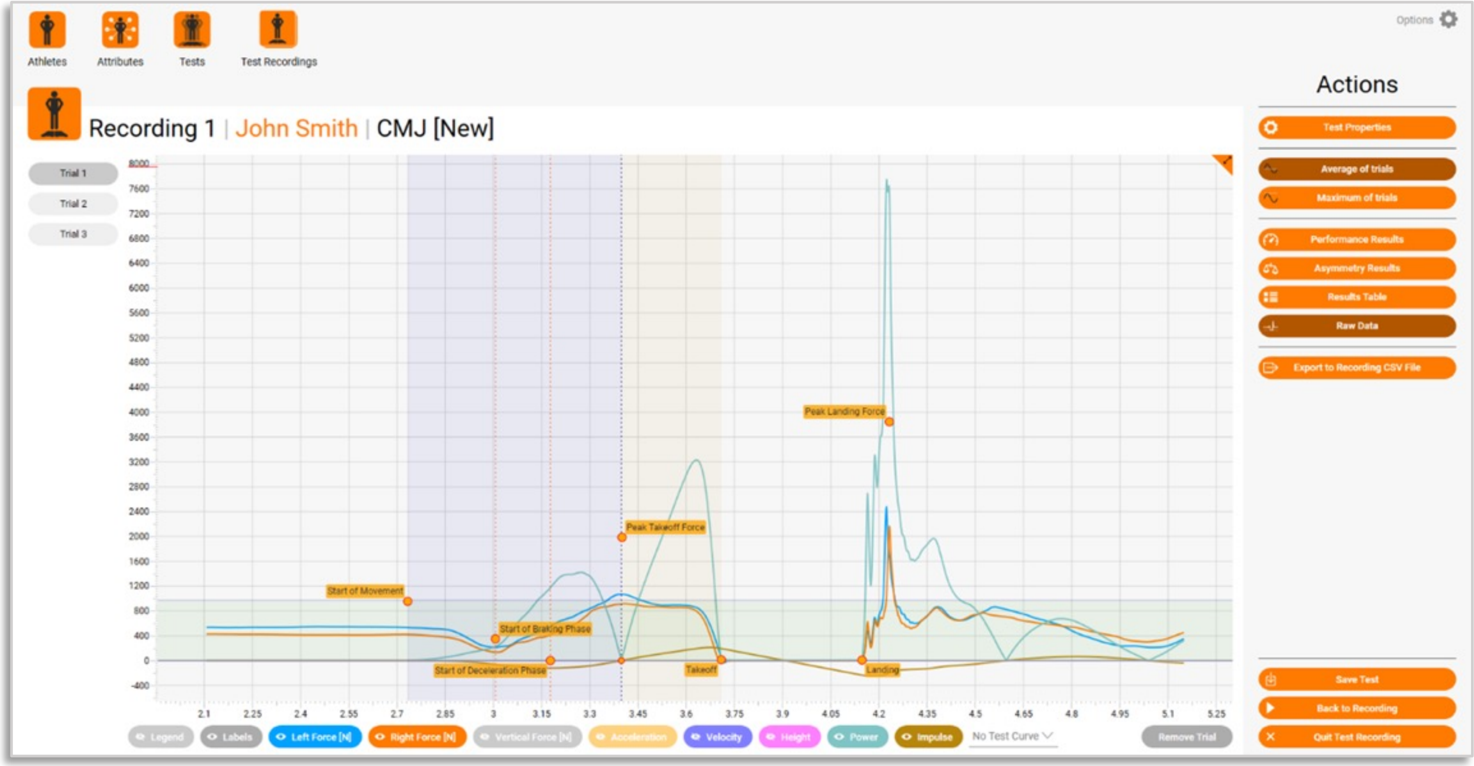
- Load & volume
- Performance metrics & tests
- Injuries

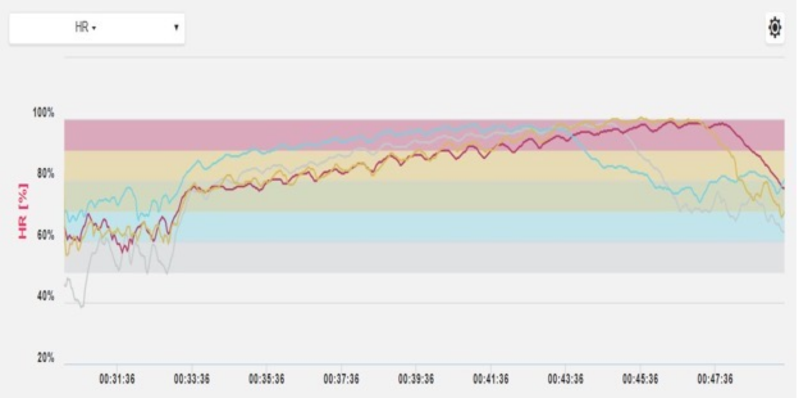
Online platforms host & automate reports
Data available to export manually to Excel or through API to R
Data used by Sports science, S&C, sport coaches, trainers and more

# Working Fast

## Day-to-Day Athletics Operations

- Data collection
    - Live, daily, weekly, longer
- Storage
- Basic analysis & reporting
- Decision making




# Working Fast

## Day-to-Day Athletics Operations

- Data collection
    - Live, daily, weekly, longer
- Storage
- Basic analysis & reporting
- Decision making

# Working Slow

## Data Science, Research, Long-Term Goals

- Data cleaning
- In-depth reports & aggregation
- Advanced analysis
- Connecting the Dots

**Conflicting Needs**

Changing data, constant additions, too many versions

Can’t have controlled experiment

Too many bottlenecks and stopping points

# Old Framework

**FAST**

- Automated reports via dashboard

**Difficult for Slow Work**

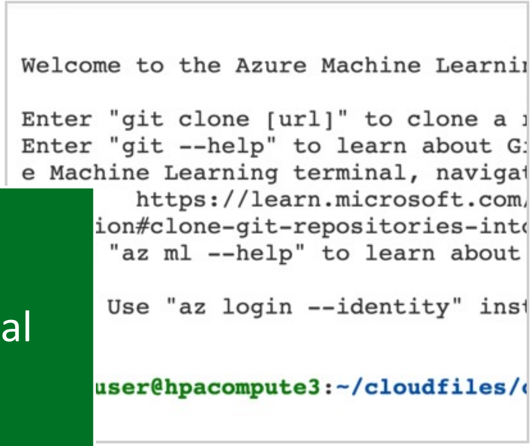
- What do we put on the dashboard? New metrics?
- No central source for raw instrument data
- Variety of IDs from different instrument interfaces
- Data in different versions, different places, different files
- CSV creation and pull was slow, too many CSVs….

# New Framework Goals

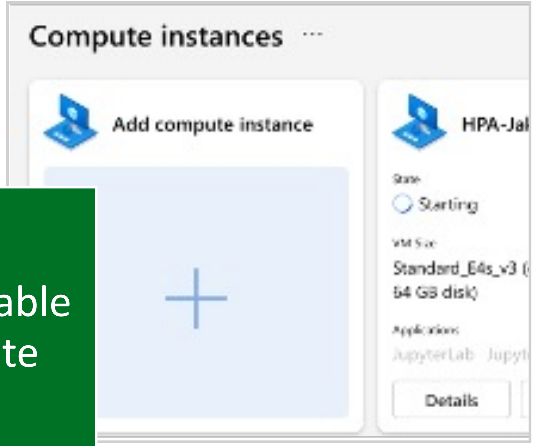
- Improve outcomes (more complete, valid, actionable data)
  - Lower barriers to more complex data science & analytics
- Aggregate data in one place
  - Easier data cleaning, validation, analysis
  - Unify player ID
- More compute power
  - Ability to collaborate & compute easier
- Less bottlenecks- duplication, updates, incomplete data
- Ability to share findings more easily

# What is Azure?

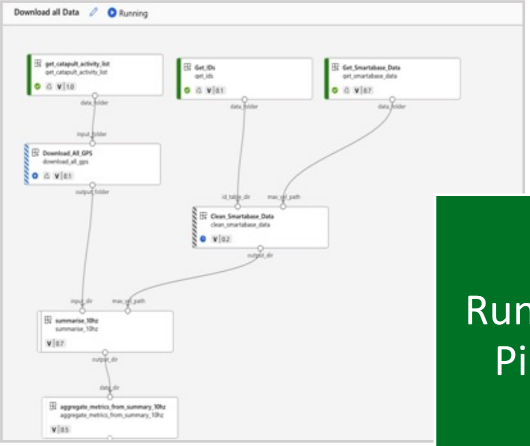

Analysis in Jupyter Notebook (R, Python, Julia)



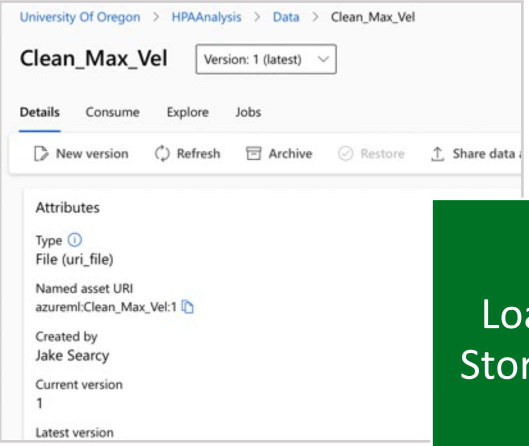

Terminal



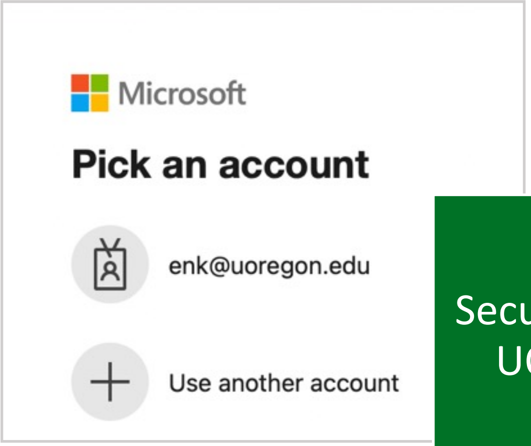

Configurable Compute




Running Job Pipelines




Loading & Storing Data




Secured with UO login

# New Framework

**FAST**

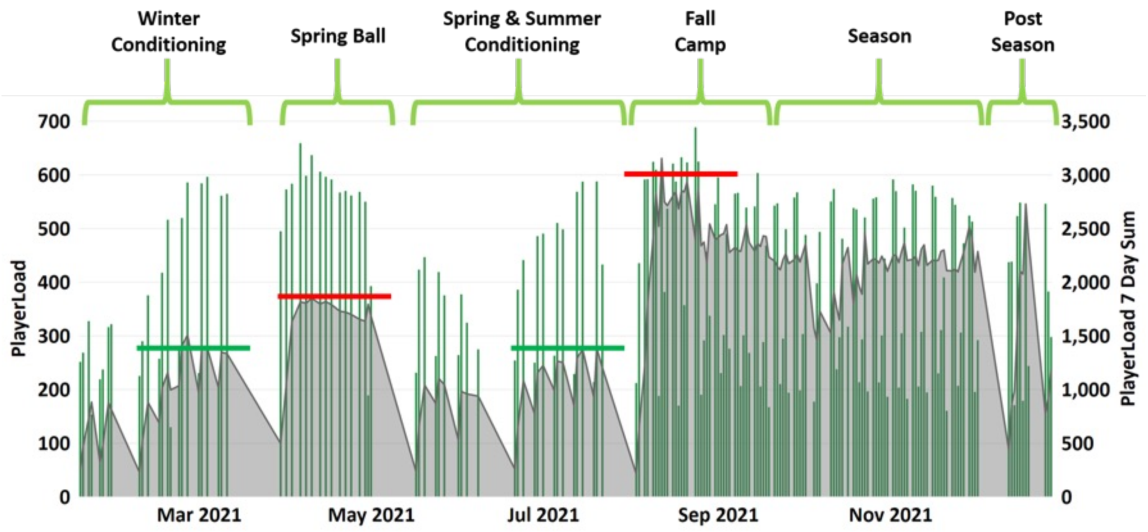
- Automated reports via dashboard → Still in use

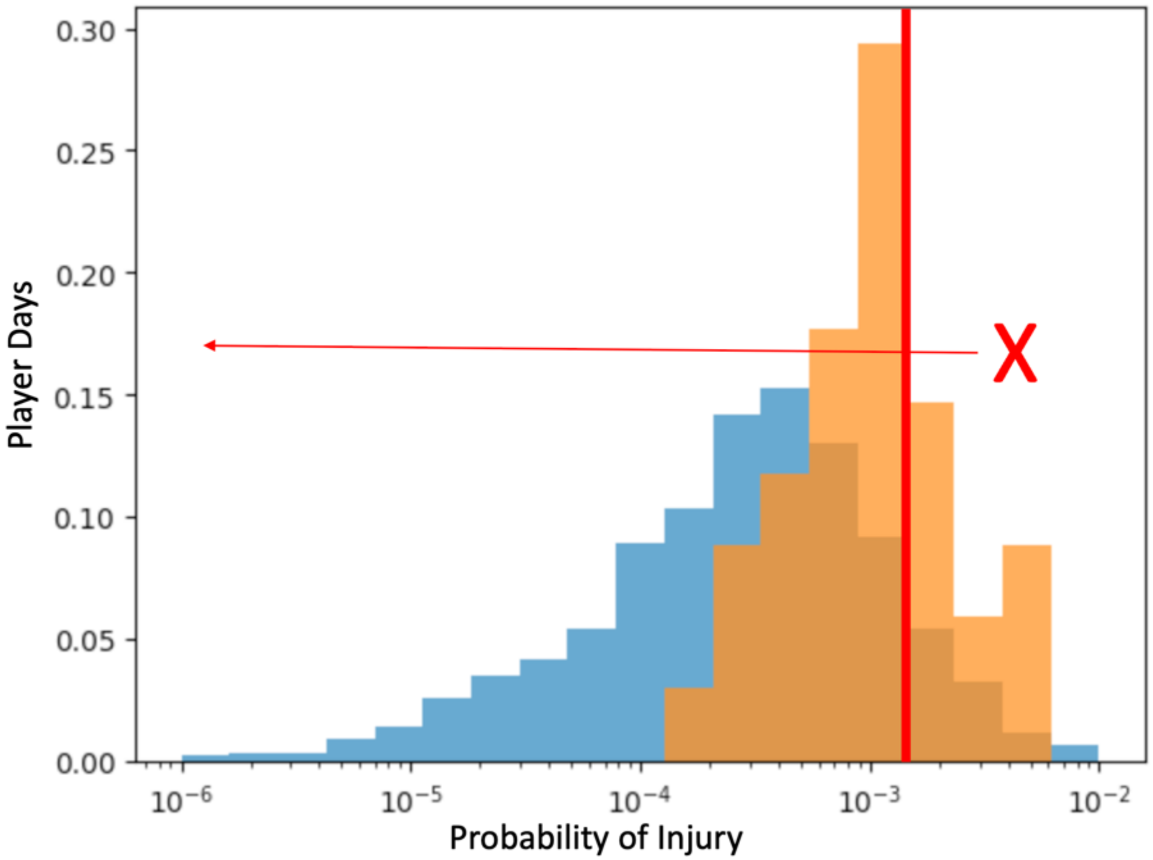
**Better for Slow Work**

- What do we put on the dashboard? New metrics? → Able to step back from constant stream of data
- No central source for raw instrument data → Able to pull from all APIs
- Variety of IDs from different instrument interfaces → Easier merging
- Data in different versions, different places, different files →Data Lives in one place
- CSV creation and pull was slow, too many CSVs…. → Easier to maintain the most recent version, quicker due to higher computing power

# What we are looking at now

- Hamstring injury predictability
- Discrete time survival models
- Differences between genders
    - Relationships between metrics
    - Response to training



# Countermovement Jump Analysis

<u>**Kinetic Variables of Interest**</u>

**Eccentric Rate of Force Development**

An athlete’s ability to generate force during the eccentric phase of the movement

**Jump Height**

The global output of the stretch shortening cycle

# Countermovement Jump Analysis

<u>**Kinetic Variables of Interest**</u>

**Eccentric Rate of Force Development**

An athlete's ability to generate force during the eccentric phase of the movement

**Jump Height**

The global output of the stretch shortening cycle

<u>**Research Questions**</u>

Is there a difference in relationship between the two variables of interest?

Can we change Jump Height or Eccentric Rate of Force Development over time as a result of training?

# Gender Differences

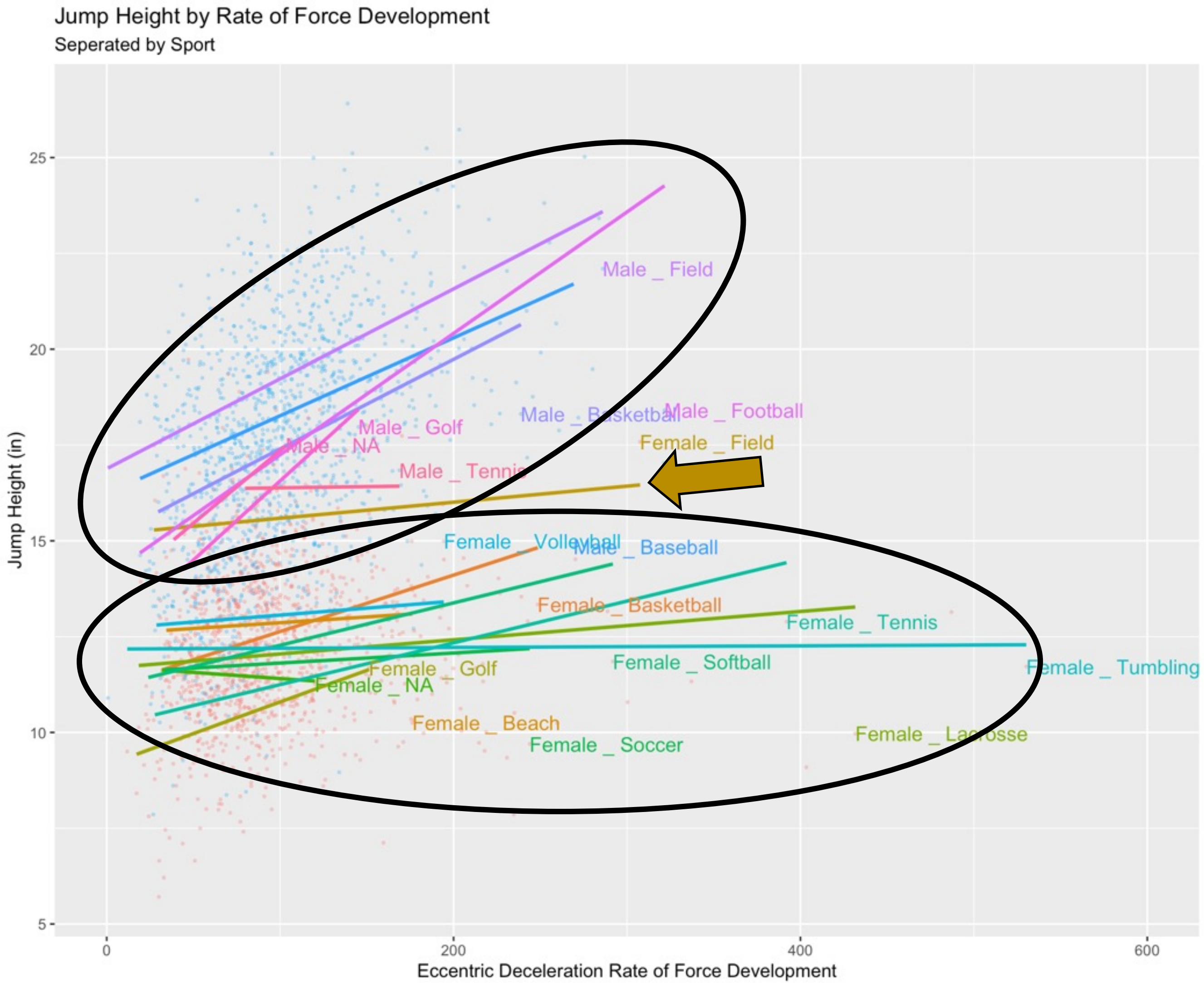
**Relationship between Eccentric Deceleration Rate of Force Development and Jump Height**

Higher Eccentric Deceleration Rate of Force Development (RFD) has stronger correlation with higher jump height for men than for women

# Regression Model

Jump Height regressed by RFD, sport (separated by gender) and interaction term between gender & RFD

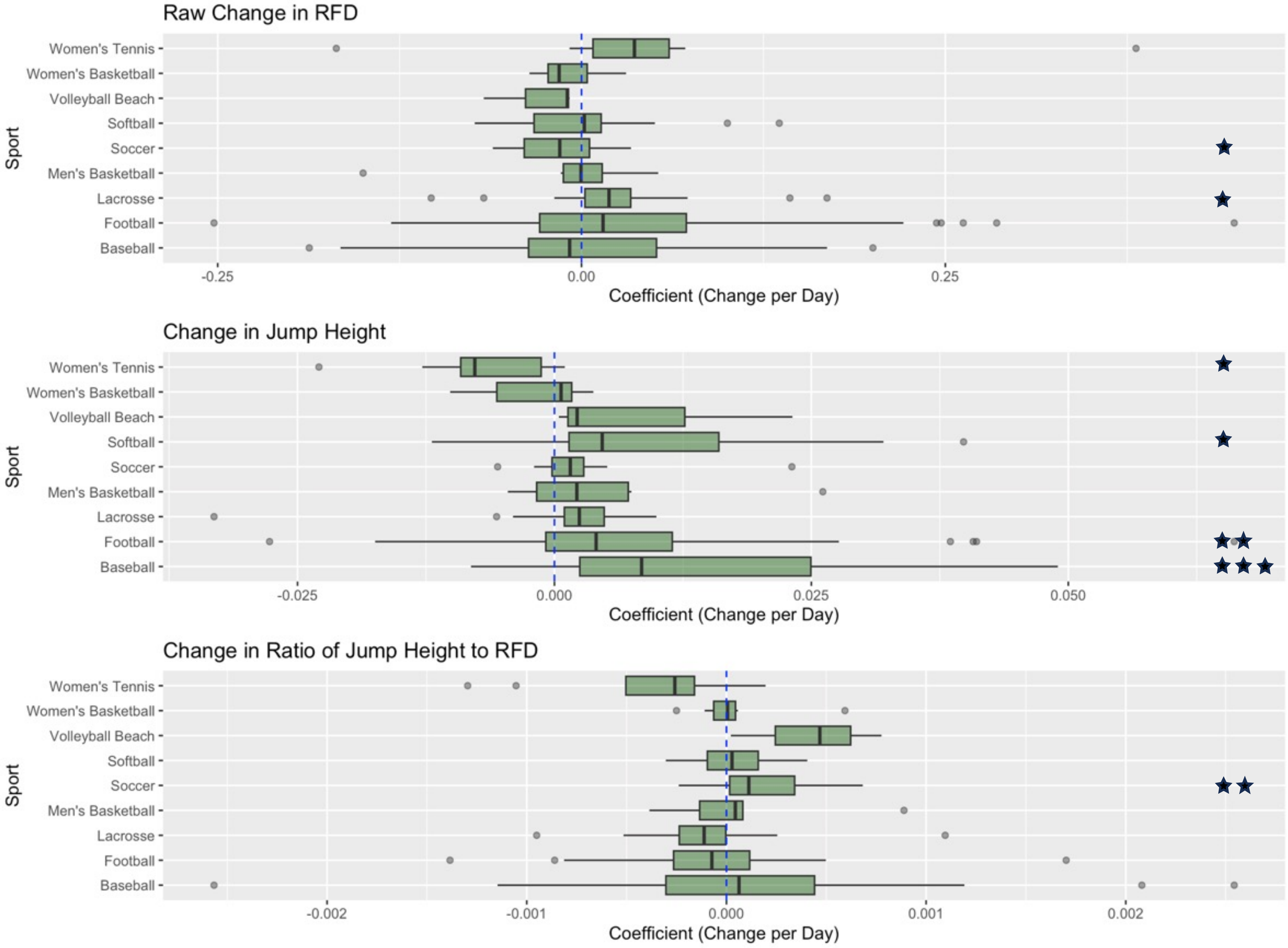
- Men’s sports generally have a significantly higher coefficient than the baseline, with a few exceptions
- Interested in sports and individuals that break this patten or improve over time
  - Can we train this?



# Training Response

Individual change regressed over their entire time at Oregon

- Trained two years at Oregon, 10 tests
- RFD over time
  - Decrease for Soccer, increase for Lacrosse
- Jump Height over time
  - Decrease for Women's Tennis, increase for Softball, Football, Baseball
- Ratio of Jump Height/RFD over time
  - Increase for Soccer



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