Asymmetry & Injuries

Analysis of Two Football Case Studies

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Overview

- Unclear Relationship Between Asymmetry & Injury Risk

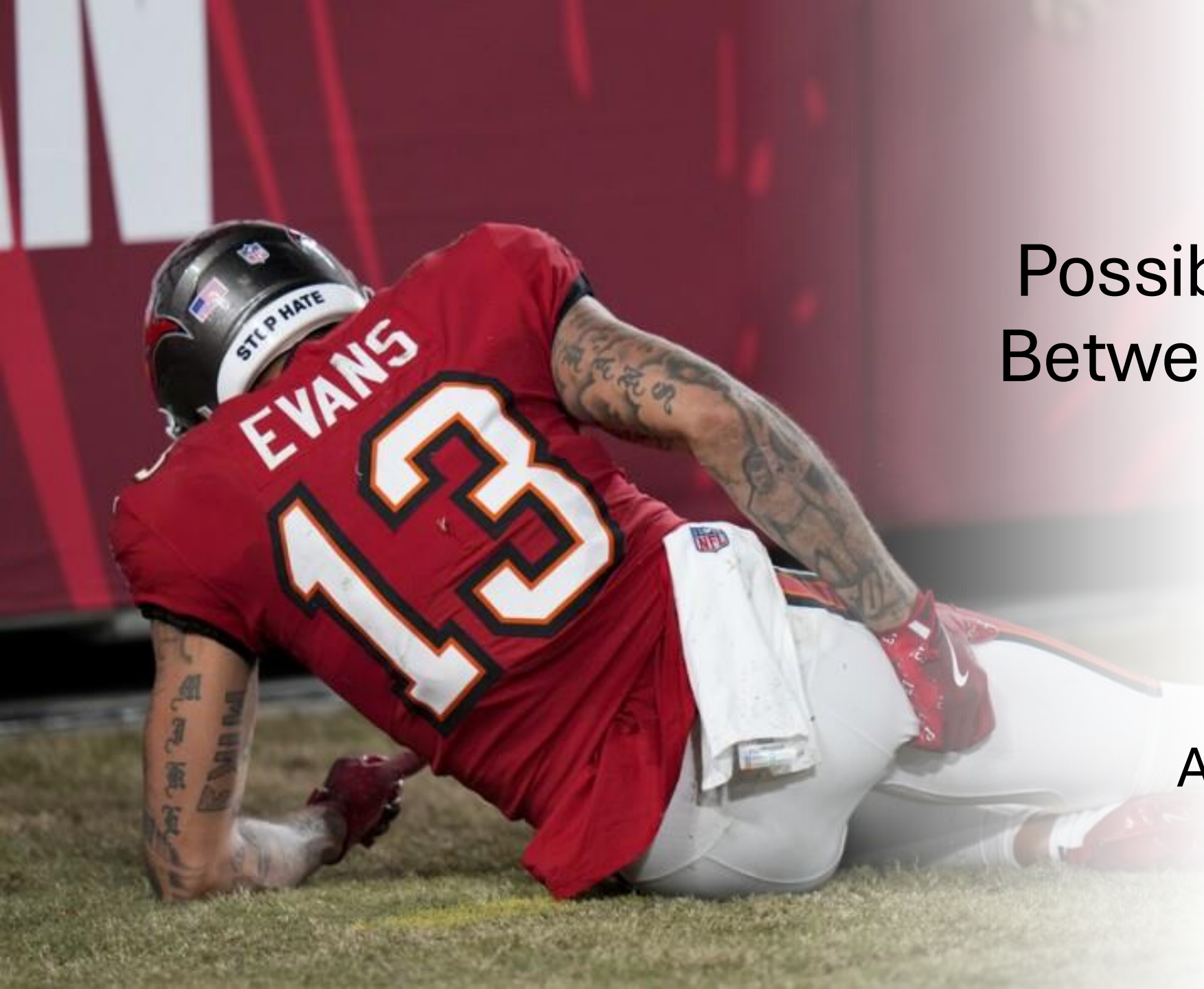
- High Levels of Asymmetry
  - Impact on Performance
  - Potential Risk of Injury

RESEARCH QUESTION:
Can we predict the risk of injury using asymmetry and performance metrics?

Data

- Players Chosen for the Case Study
  - Tight End (TE)
  - Defensive Tackle (DT)

- Data Sources
  - Catapult
  - Force Plate
  - NordBord
  - Injury
  - Hydration



Possible Connections Between Asymmetry & Injuries

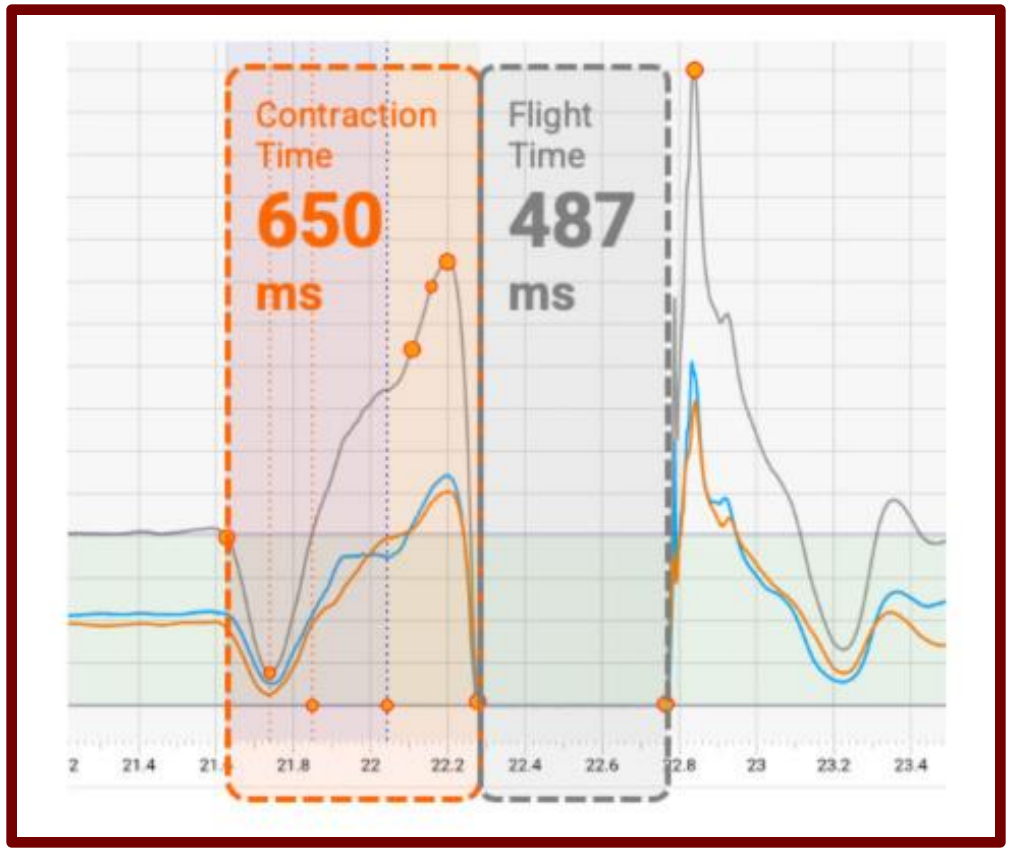
Performance and Asymmetry Metrics

Performance Metrics - Catapult

- Total Player Load
- Player Load Per Minute
- Acceleration Band 4 Total Duration
- IMA Acceleration Medium
- IMA Deceleration Medium

Performance Metrics – Force Plates

- Jump Height (Flight Time)
- Reactive Strength Index (RSI) Modified
  - RSI-modified = Jump Height / Contraction Time
- Peak Power
- Eccentric Duration
  - Longer with higher soreness
- Countermovement Depth
  - Less deep with higher soreness



Asymmetry Metrics

- Average Medium Cuts - Left
- Average Medium Cuts – Right
- Average High Cuts - Left
- Average High Cuts – Right

CATAPULT DATA

- Concentric Mean Force Asymmetry
- Eccentric Mean Force Asymmetry
- Force at Zero Velocity Asymmetry
- Concentric Impulse 100 ms Asymmetry
- Eccentric Braking Impulse

FORCE PLATE DATA

- Average Force Asymmetry
- Max Force Asymmetry
- Impulse Asymmetry
- Torque Asymmetry

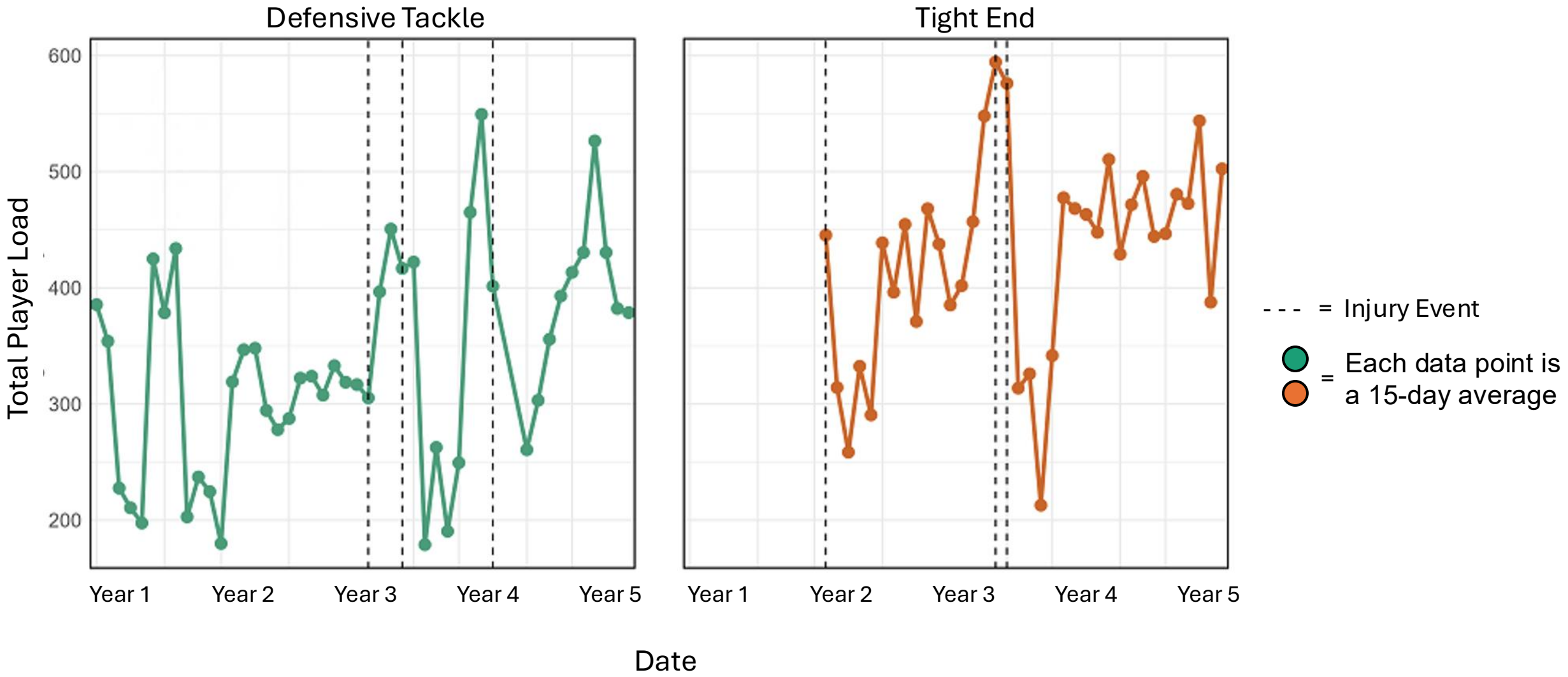
NORDBORD DATA

Possible Connections Between Asymmetry & Injuries

Analysis

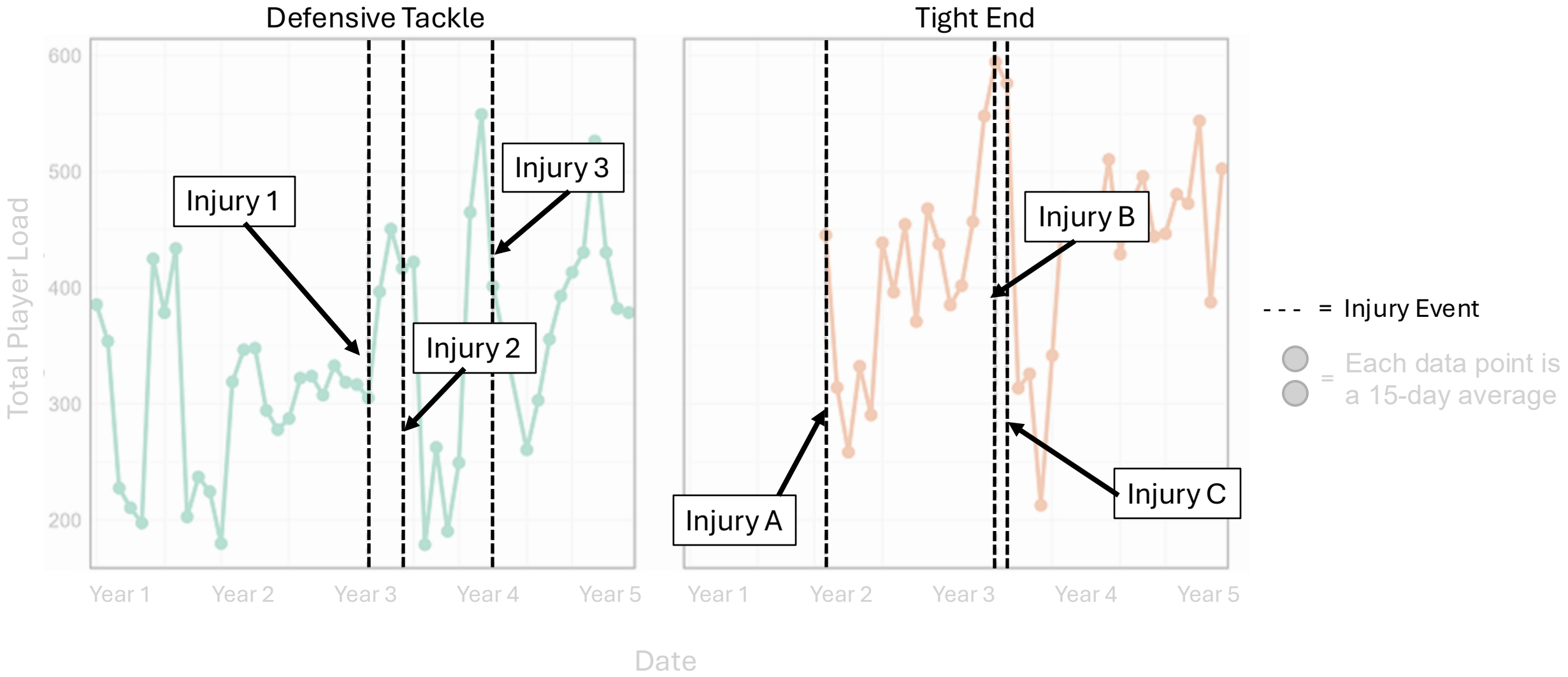
Total Player Load & Injury Risk

Catapult Data



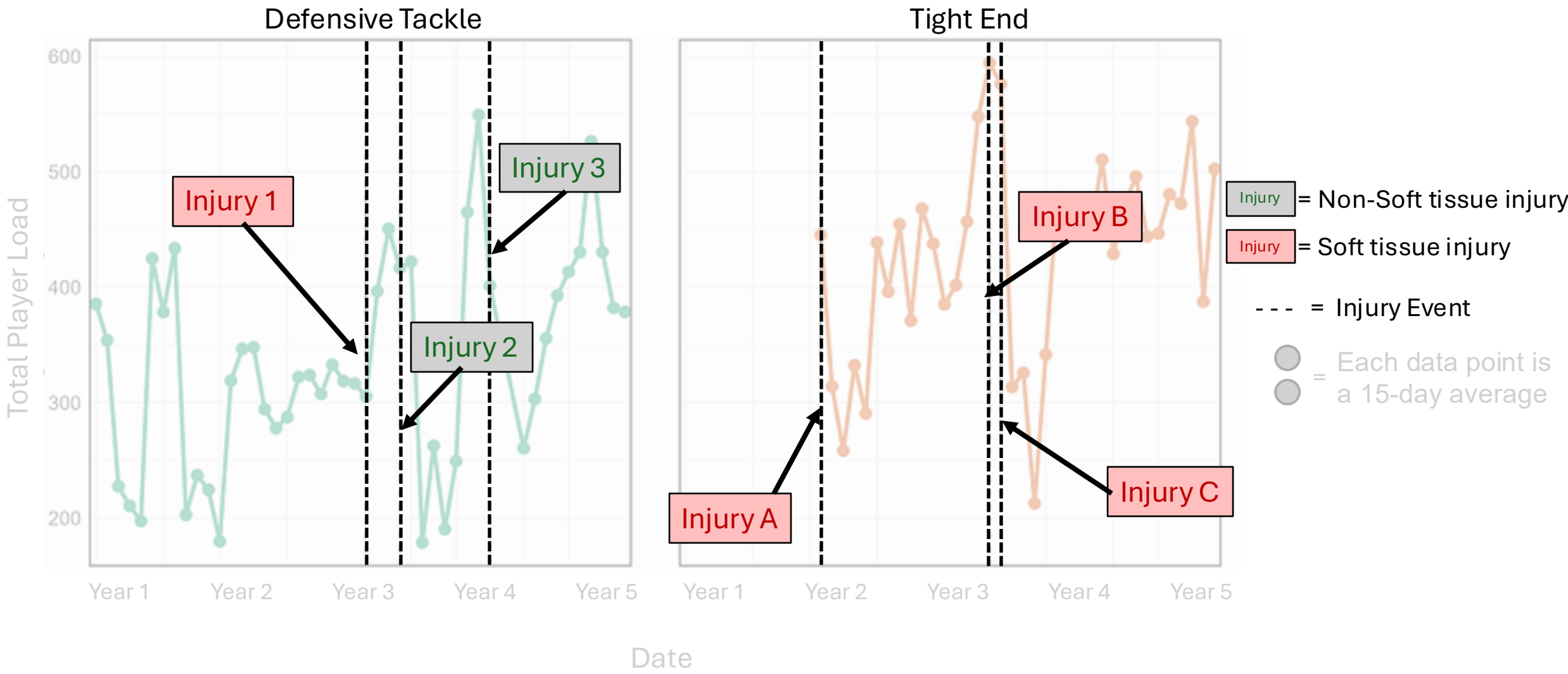
Total Player Load & Injury Risk

Catapult Data



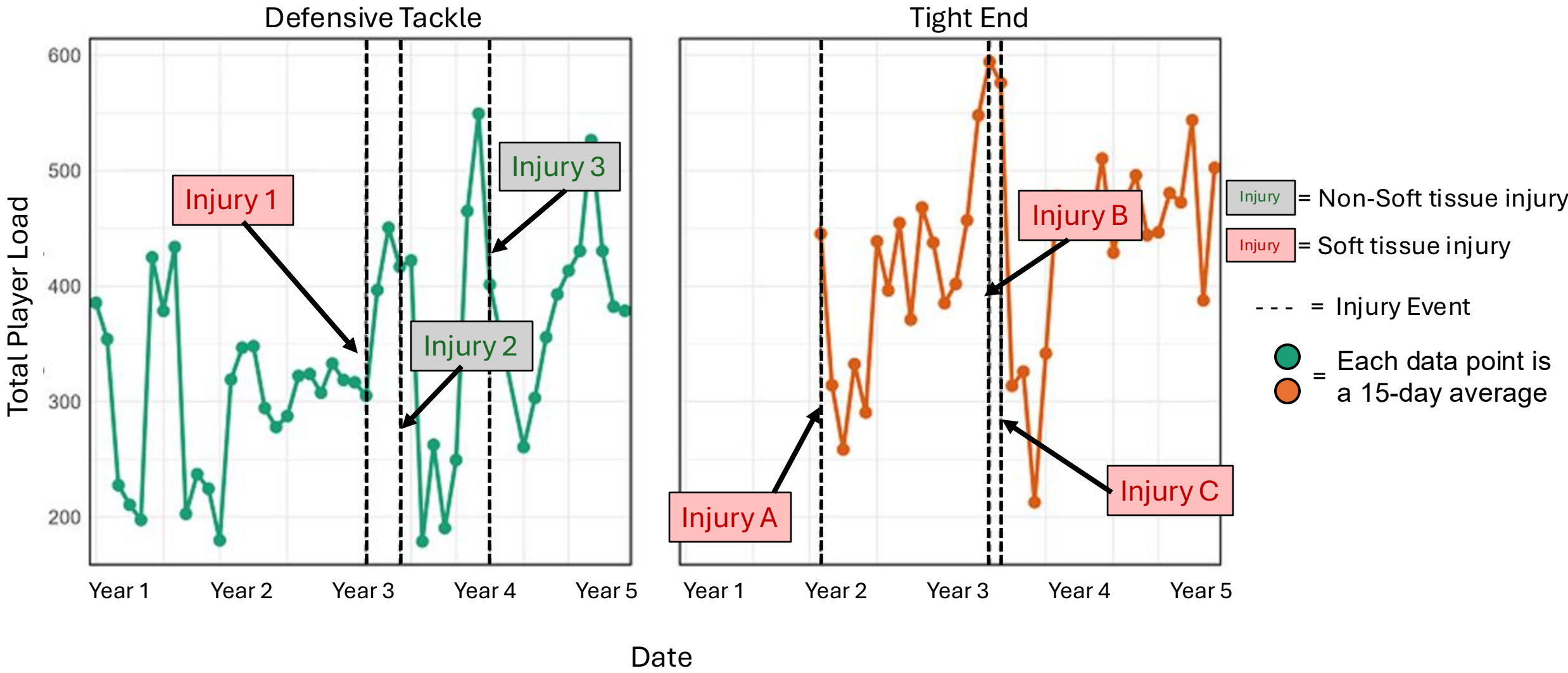
Total Player Load & Injury Risk

Catapult Data



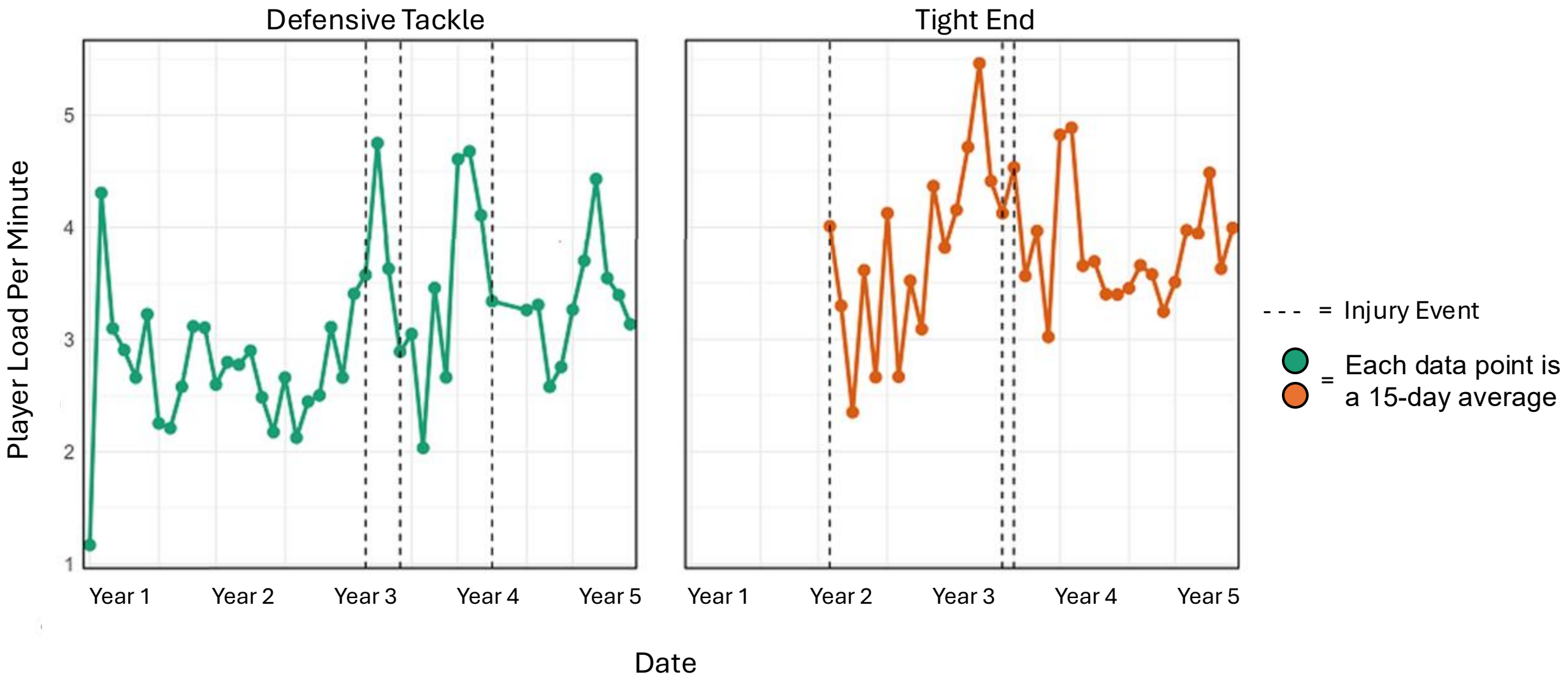
Total Player Load & Injury Risk

Catapult Data



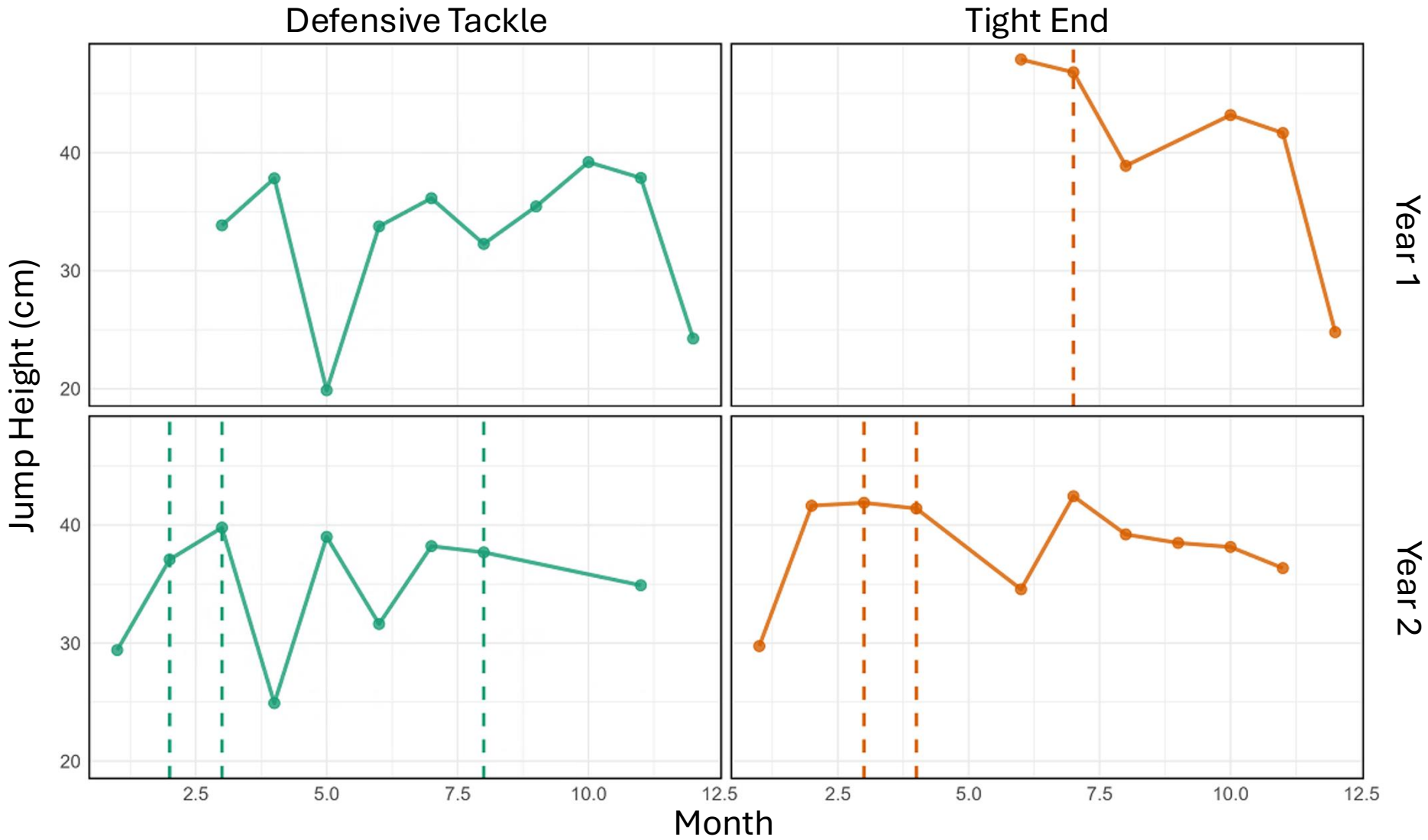
Player Load Per Minute & Injury Risk

Catapult Data



Jump Height & Injury Risk

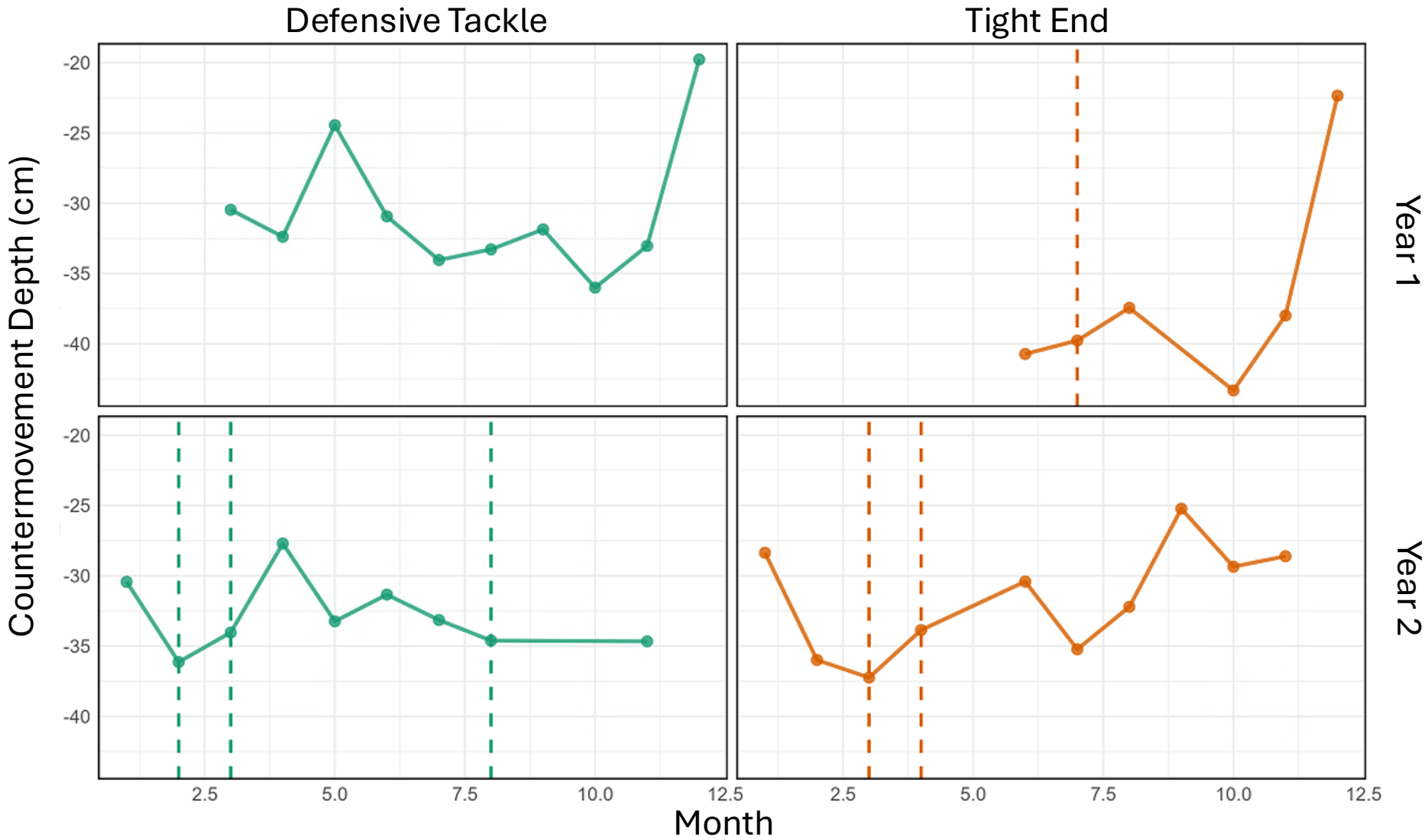
Force Plate Data



- - - = Injury Event

Countermovement Depth & Injury Risk

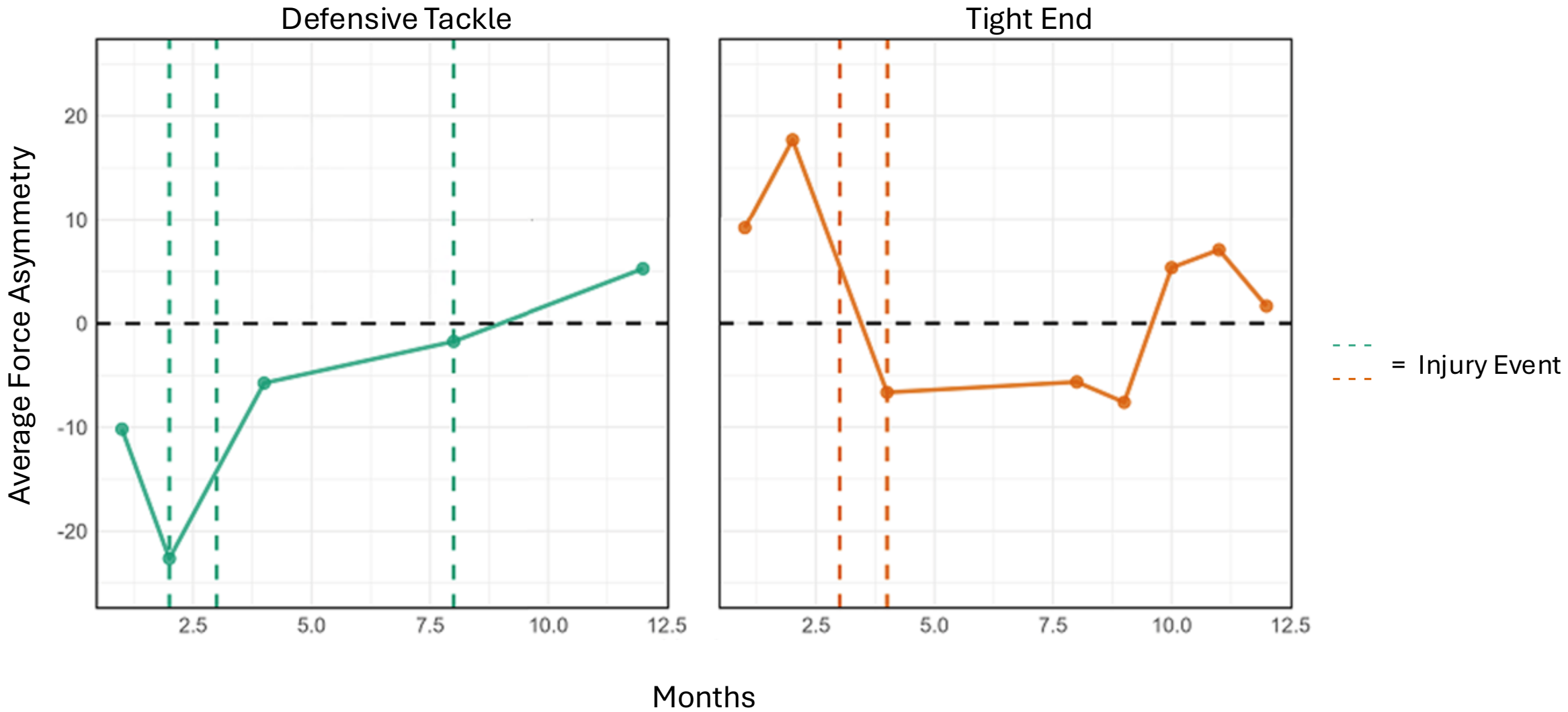
Force Plate Data



- - - = Injury Event

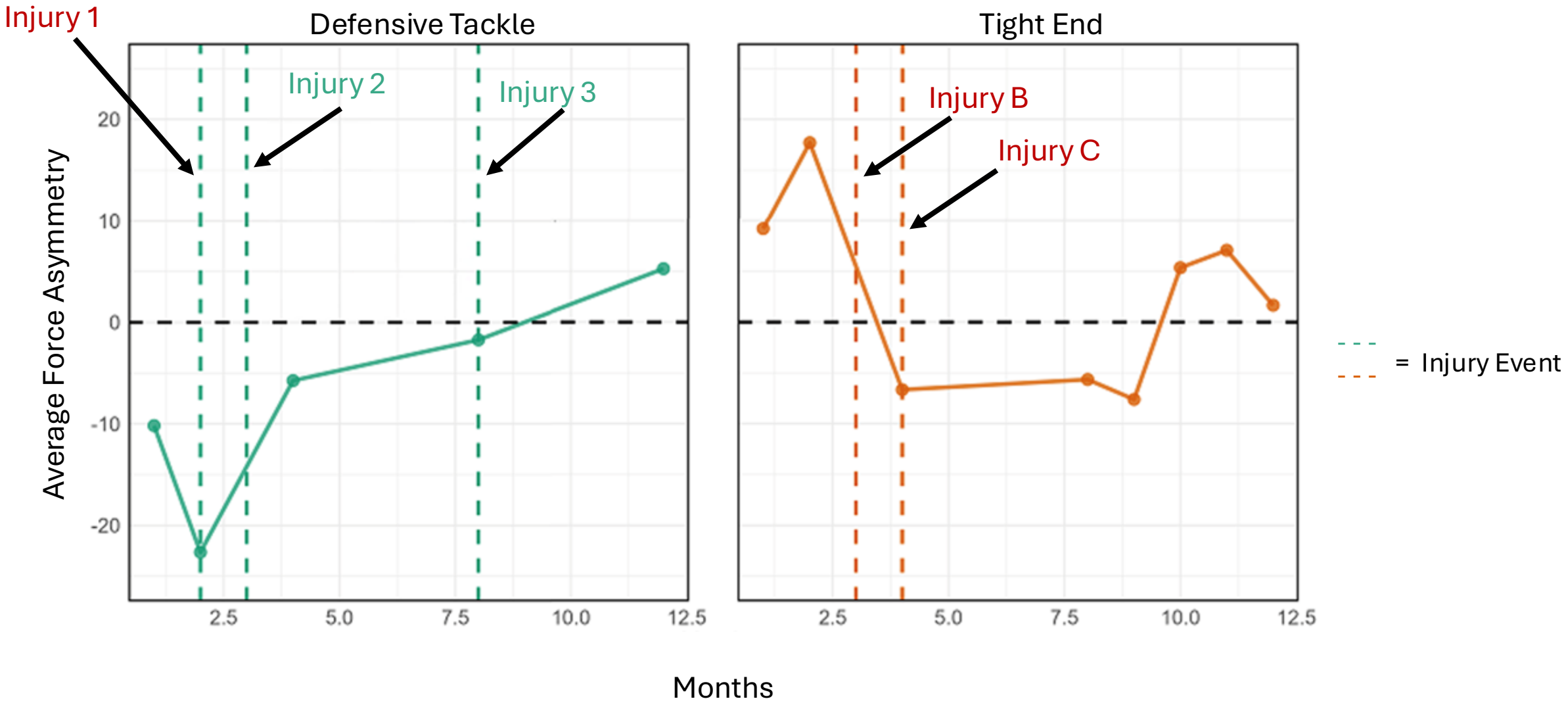
Average Force Asymmetry & Injury Risk

NordBord



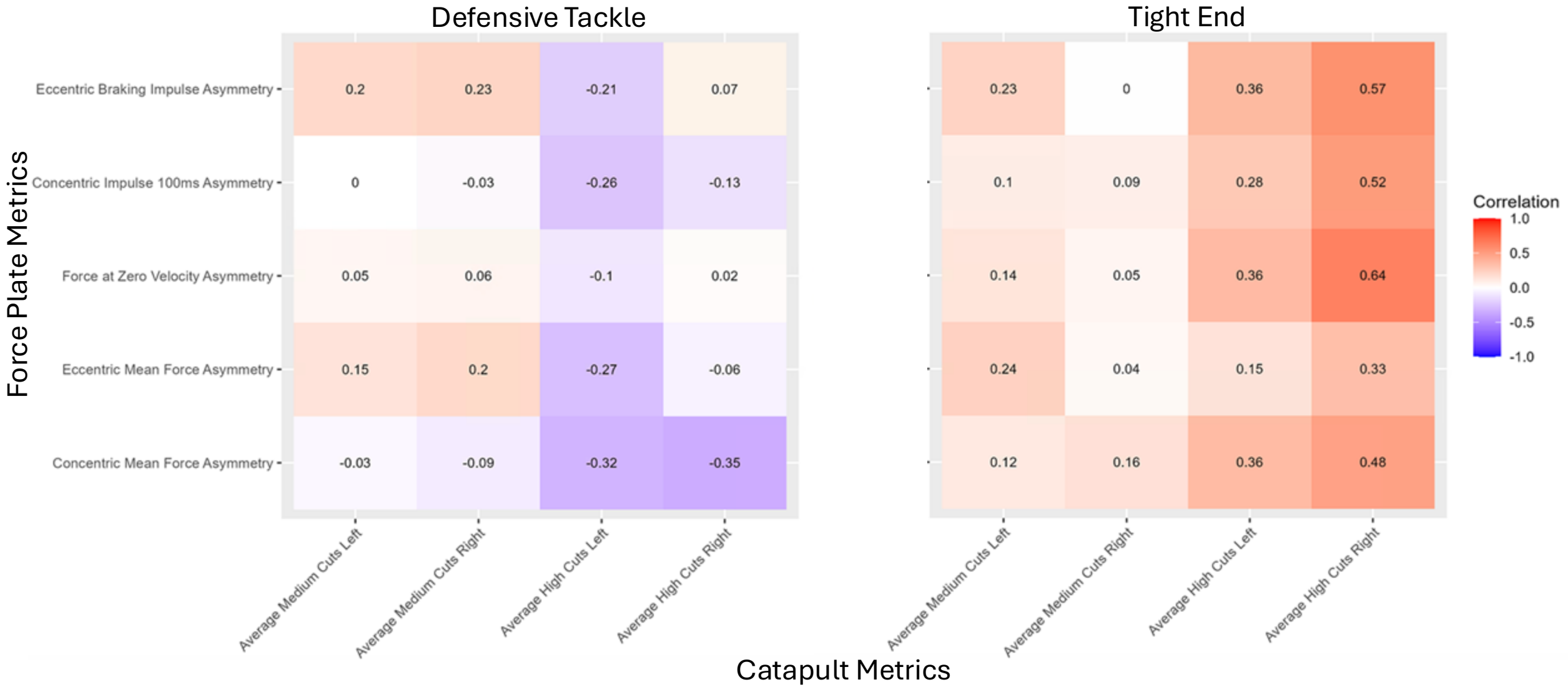
Average Force Asymmetry & Injury Risk

NordBord



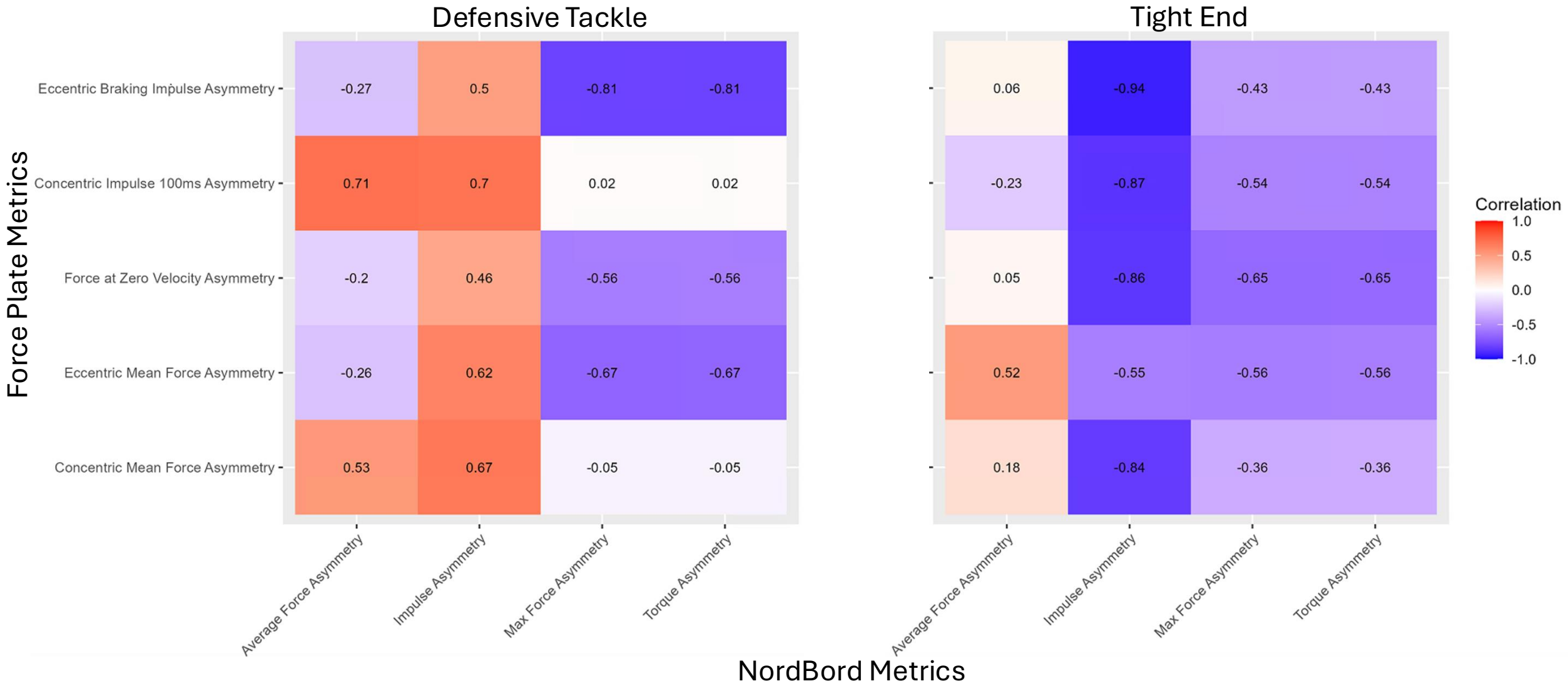
Asymmetry Comparisons

Force Plate vs Catapult

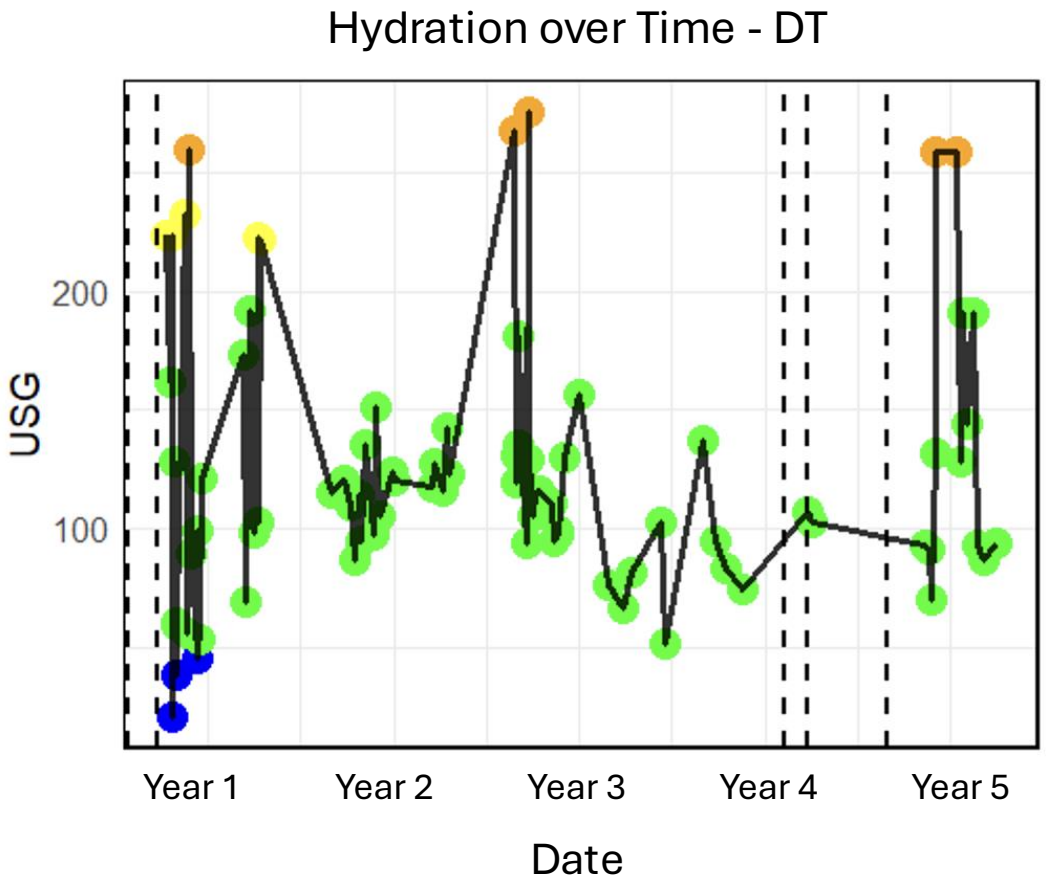


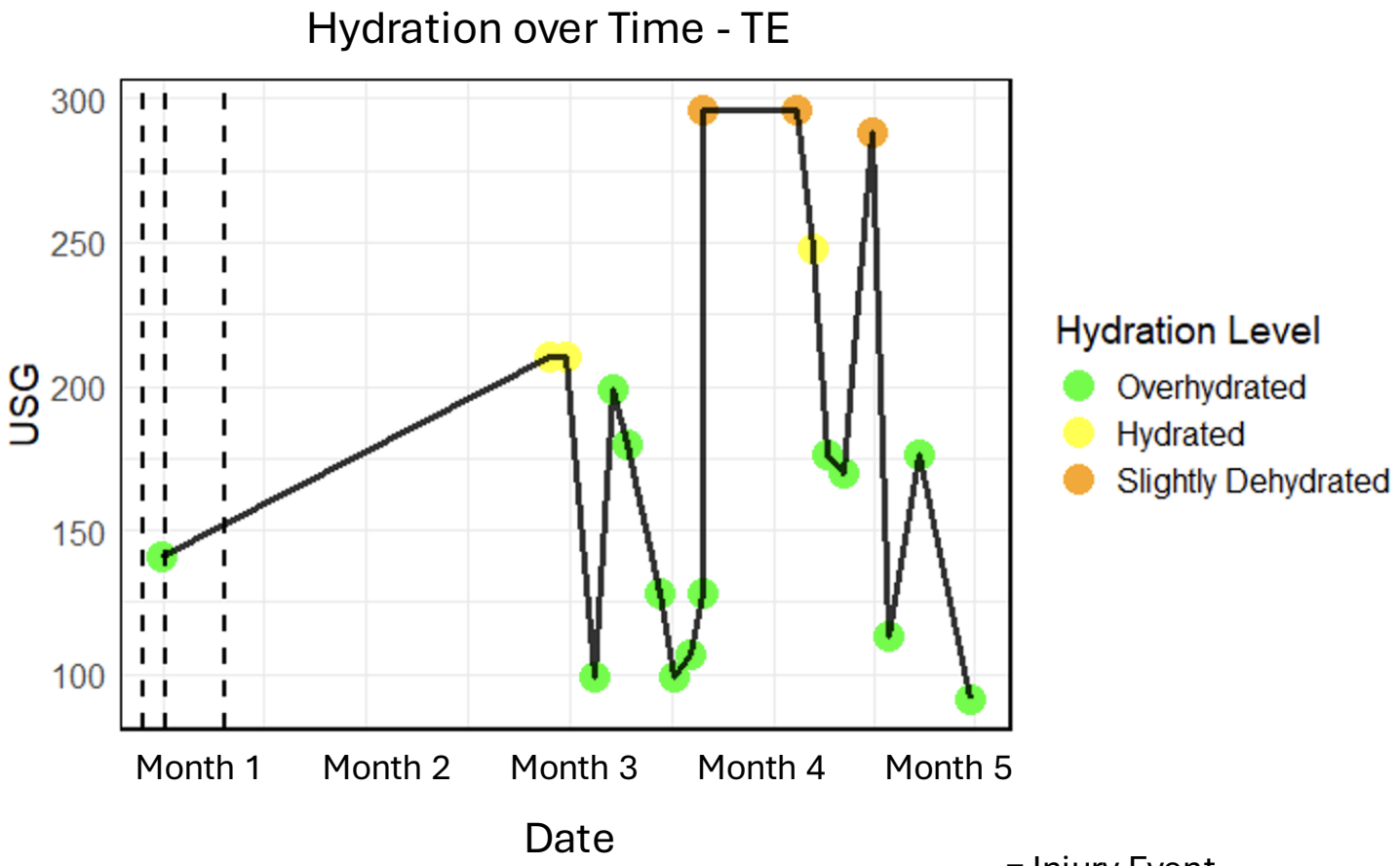
Asymmetry Comparisons

Force Plate vs NordBord



Hydration & Injury Risk





- - - = Injury Event
USG = Urine Specific Gravity

Key Findings

- Catapult
  - Injuries happened in periods of high changes in *Total Player Load* and *Player Load Per Minute*
- Force Plate
  - Injuries happened during peak *Jump Height* performance and elevated *Countermovement Depth*
- NordBord
  - Injuries happened when the average force asymmetry was high or there was a big change in asymmetry in a short amount of time (even if asymmetry was decreasing)
- Force Plate – Catapult Interactions
  - DT mostly both sides injuries: low correlation
  - TE mostly right-side injuries: many high cuts right → higher asymmetry
- Force Plate – NordBord Interactions
  - *Max Force Asym* & *Torque Asym*: negative correlation *with Force at Zero Velocity* & *Eccentric Mean Force*
  - *Impulse Asym:* opposite behavior between the two athletes
- Hydration
  - No clear relationship between injuries and hydration

Questions?