Hypotheses for Research Questions

1) What are meaningful thresholds for strength metrics as they relate to lower body injury risk?
    a. For example, one of our strength coaches uses 5 times body weight (kg) in Newtons for hamstring strength as a cutoff for injury risk. Is this supported by our data?

Female athletes with hamstring strength < 5 × body weight exhibit significantly higher incidence of lower-body injuries compared to those above this threshold.

"Additionally, athletes with neuromuscular deficits including strength deficits in the hamstrings, quadriceps and profound imbalance in hamstring-quadriceps (H/Q) ratio <60% have been reported to have a heightened risk of lower limb injuries, especially hamstrings and ACL injuries." (https://pmc.ncbi.nlm.nih.gov/articles/PMC11268924/)

More meaningful thresholds for strength metrics will be looked at and created.

2) What trends in strength do we see across the women's team sports?
    a. Soccer, lacrosse, volleyball, basketball.

Positional differences within sports correspond to distinct lean mass and strength profiles measurable through VALD metrics.

Strength trends between soccer and lacrosse will be similar as these sports have a longer running style. Likewise, volleyball and basketball will have similar strength trends as they both focus more on jumping and short bursts of speed, along with greater upper body strength.

All women's team-sport athletes exhibit common hamstring-to-quad imbalances, with soccer athletes showing slightly higher functional strength ratios than the others.

Roadmap

Documentation Style: finished products of work uploaded as a PDF

Week 1:

Wednesday

- Finish up last project + Start on project roadmap

Thursday

- Start on literature review + finish up project roadmap

Monday

- Continue literature review + create hypotheses for research questions

Tuesday

- Finish literature review + add final pdf documents to the repository
- Begin looking at datasets

Week 2:

Wednesday

- Uncompress all 16 datasets
- Begin filtering down datasets + analyze the variables

Thursday

- Discuss how we want to deal with NAs or missing data
- Finish filtering all datasets + add to final notebook

Monday

- Create exploratory plots + graphs
- Create insights about the distributions of valuable variables within the datasets

Tuesday

- Join VALD datasets together within the sports
- Analyze the different tests within Nordbord datasets

Week 3:

Wednesday

- Join strength datasets with incident reports
- Could do all lower body injuries or do different groups of injuries separately (at least ACL injury by itself)
- Can look at ACL injuries across all 4 women's sports + each individual sport + stand out positions in each sport at a higher risk of ACL injury

Thursday

- Analyze relationships between position and strength within each sport (each look at 2 of the 4 different sports)

Monday

- Use modeling/statistical tests to begin looking for thresholds
- Verify example threshold of 5 times bodyweight for hamstring strength

Tuesday
- Continue analyzing thresholds

<u>Week 4:</u>

Wednesday
- Compare strength trends between the sports using graphs, statistical tests

Thursday
- Analyze how positions compare across sports (ex. blocker in volleyball vs center in basketball)

Monday
- Look back at the questions and prepare formal answers

Tuesday
- Finish answering both questions

<u>Week 5:</u>

Wednesday
- Consolidate all work into one notebook that is organized
- Begin writing technical writeup
- Make sure all notebooks are commented well
- Begin creating graphics for slideshow presentation

Thursday
- Finish writing technical writeup
- Continue creating graphics for the presentation

Monday
- Finish creating graphics
- Work on creating the slideshow
- Organize repository

Tuesday
- Finishing touches to the presentation and repository