

## Introduction

- There is a significant financial cost associated with time lost from lower extremity musculoskeletal injuries (MSKI) in tactical athletes.
- The presence of lower extremity asymmetries may result in alterations in movement patterns and lead to MSKI. Specifically, single leg stance anterior reach asymmetry (ARA) between limbs has been associated with a two-fold greater likelihood of injury.
- Identifying lower extremity asymmetries and establishing proactive training protocols may decrease the risk of MSKI.
- More recently, with increased portability, dual force plates (FP) are a viable option for evaluating asymmetries. FP metrics during a countermovement jump (CMJ) are commonly used to assess fatigue and subsequently, injury risk. At present, it is unclear whether FP asymmetry metrics are redundant or complimentary to ARA assessments.

## Purpose

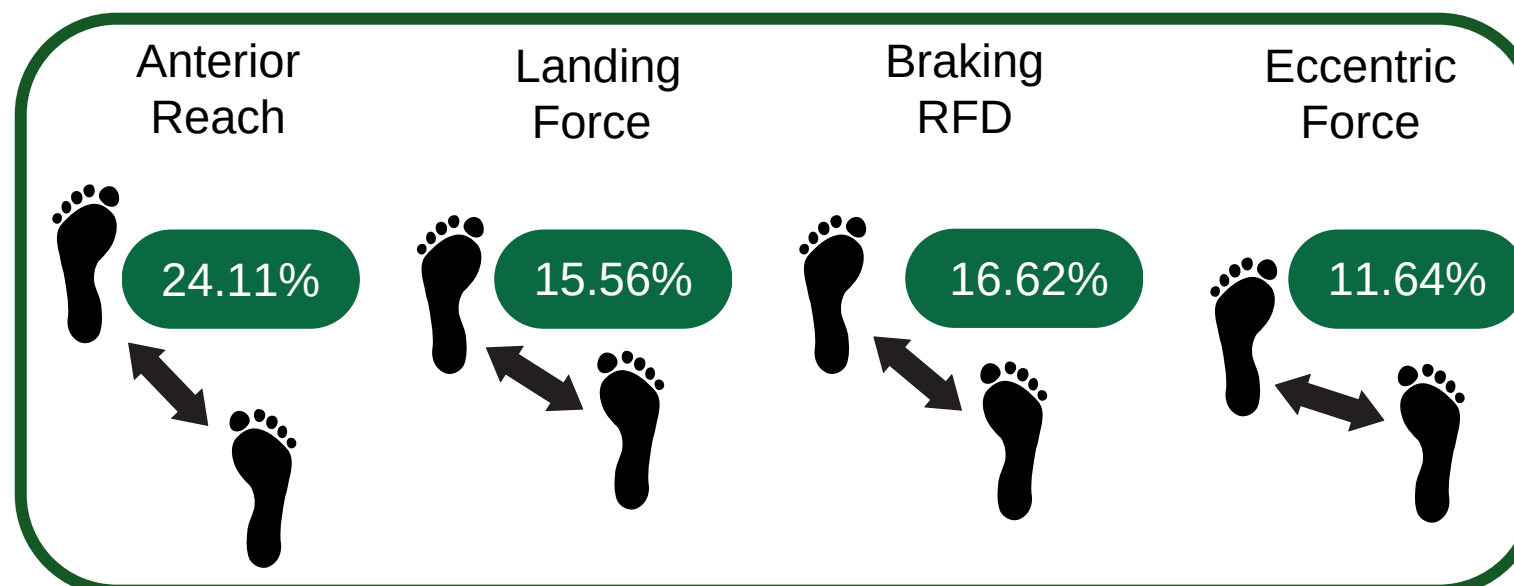
The purpose of this study was to analyze whether ARA show agreement with FP asymmetry metrics during a CMJ.

## Methods

- Demographics: 77 ROTC cadets (58 males, 19 females, age=21.5±2.8) participated
- Anterior Reach Asymmetry Assessment
  - Cadets' right and left leg length were recorded
  - Cadets performed three trials per leg on a unilateral anterior reach with the greatest reach distance on each stance leg used to compute the ARA
- Countermovement Jump
  - Cadets performed two maximal effort CMJs on dual FP with 30 seconds rest between attempts
  - FP data was sampled at 1000 Hz
  - Mean eccentric, braking and landing phase asymmetries were averaged across the two attempts then converted to percent difference between left and right legs
- Statistical analysis
  - Dependent t-tests assessed differences in leg asymmetries between anterior reach and FP metrics.
  - Bonferroni corrections for multiple comparisons were used. Pearson correlations assessed relationships between FP metrics.  $\alpha = 0.05$ .

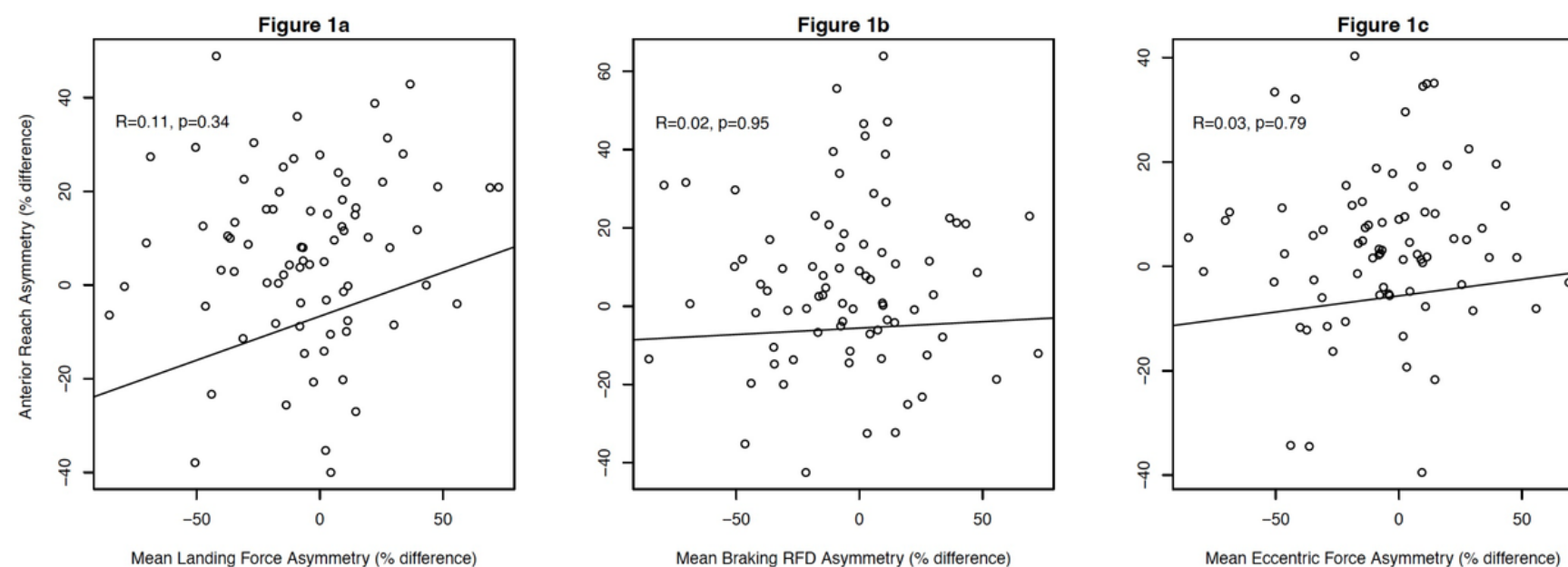
## Key Findings

**Asymmetry was greater during a unilateral anterior reach assessment than in countermovement jump metrics**



**There was no correlation between anterior reach and countermovement jump asymmetries**

## Correlation between Anterior Reach Asymmetry and CMJ Asymmetry



## Results

ARA percent difference were significantly greater than percent difference in landing force ( $p=0.006$ ), braking RFD ( $p=0.036$ ) and eccentric force asymmetries ( $p < 0.001$ ). There was no significant correlation between ARA and landing force ( $R=0.11$ ,  $p=0.34$ ), braking RFD ( $R=0.02$ ,  $p=0.95$ ), and eccentric force asymmetries ( $R=0.03$ ,  $p=0.79$ ; Figure 1). There was a significant correlation between braking RFD and landing force asymmetries ( $R=0.32$ ,  $p=0.005$ ) and eccentric and landing force asymmetries ( $R=0.26$ ,  $p=0.025$ ). There was no significant correlation between braking RFD and landing force asymmetries ( $R=0.01$ ,  $p=0.915$ ).

## Conclusion

- The findings from the study indicate that FP metrics are complimentary and not redundant to ARA.
- This could be expected when considering differences in biomotor abilities required of a single leg anterior reach compared to a bilateral CMJ.
- Explosive bilateral movements (i.e. CMJ) require large bilateral muscle groups to perform coordinated force production while the anterior reach is sensitive to limitations in flexibility and neuromuscular control to stabilize the stance leg.
- A limitation of the current study was cadets' inexperience with the ARA and CMJ assessments.

## Practical Applications

- FP based CMJ assessments should be viewed as complimentary to a unilateral anterior reach movement assessments when creating a tactical athlete's movement profile.
- Considering that both are time expedient and reliable measures of movements associated with MSKI risk factors, it would be advised to perform both assessments when possible.
- This sample of ROTC cadets had a mean absolute ARA of  $3.12\text{cm} \pm 2.55\text{cm}$ , which is congruent with mean asymmetries previously reported in tactical populations. However, with a range of 0-12cm of asymmetry, some cadets exceeded the threshold of 4cm in which lower extremity injury risk increases.
- Similarly, asymmetries in CMJ landing forces indicate that some cadets are at an increased risk for sustaining a lower extremity injury. Thus, movement screening and proactive training interventions should be implemented within this population.