

ABSTRACT

Countermovement jumps (CMJ) are regularly used as a baseline assessment for athletic performance to aid in measuring fatigue, biomechanical asymmetries, and to quantify adaptations to training. Due to the differences in anatomical and physiological makeup between the sexes, it is important to examining unique contributors to athletic performance.

PURPOSE: The purpose of this study was to identify primary contributors of CMJ performance between men's and women's NCAA Division II athletes.

METHODS: 15 men (height: 194.3 ± 5.6 cm., weight: 89.4 ± 6 kg., BMI: 23.7 ± 1.9 kg/m²) and 15 women (height: 179.1 ± 5.33 cm., weight: 75.6 ± 11.3 kg., BMI: 23.5 ± 2.5 kg/m²) NCAA Division II collegiate basketball players performed 2 CMJ with an arm swing (CMJ-AS) on a portable dual-force plate system (Hawkin Dynamics, ME). Pearson's correlation analyses were utilized to identify significant jump characteristic differences between men's and women's basketball athletes.

RESULTS: For women's basketball athletes, takeoff velocity, relative propulsive net impulse, peak relative propulsive power, and tendon stiffness associated most to CMJ performance ($p < 0.01$; $r = 1.00 - 0.729$). For men's basketball athletes, takeoff velocity, relative propulsive net impulse, peak propulsive power, and jump momentum associated most to a CMJ ($p > 0.01$; $r = 1.00 - 0.786$).

CONCLUSION: Results suggested that takeoff velocity, relative propulsive net impulse, and peak relative propulsive power had the strongest relationship with CMJ height for both men and women basketball athletes. This demonstrates that regardless of sex, an athlete's ability to express force concentrically at the instant of takeoff directly correlates to their ability to jump, especially during the propulsive phase of the jump for the last two listed. However, unique relationships were also observed between sexes. Tendon stiffness for women and jump momentum for men were strongly related to jumping performance.

INTRODUCTION

- During competition, collegiate basketball athletes must perform actions with high intensity that entail of high amounts of power, speed, agility, muscle strength, balance, and stability.
- These movements are characteristics that are demonstrated through sprinting, jumping, and changing direction.
- Force plates allow for testing and assessing force output, asymmetries, the power, and velocities that some of these movements are occurring at
- By using force plates, we can track said characteristics to allow for us to better prepare athletes and reduce risk and injury within sport.



METHODS

- 15 men (height: 194.3 ± 5.6 cm., weight: 89.4 ± 6 kg., BMI: 23.7 ± 1.9 kg/m²) NCAA Division II collegiate basketball players
- 15 women (height: 179.1 ± 5.33 cm., weight: 75.6 ± 11.3 kg., BMI: 23.5 ± 2.5 kg/m²) NCAA Division II collegiate basketball players
- The athletes performed 2 CMJ with an arm swing (CMJ-AS) on a dual-force plate system (Hawkins Dynamics-ME).
- After data was collected, Pearson's correlation analyses were utilized to identify significant jump characteristics between the men's and women's basketball athletes.

RESULTS

Women's and Men's Athletes

- Takeoff velocity ($p = 1.00$; $p = 0.999$)
- Relative propulsive net impulse ($p = 0.999$)
- Peak relative propulsive power ($p = 0.924$; $p = 0.923$)

Men's

- Jump momentum ($p = 0.786$)

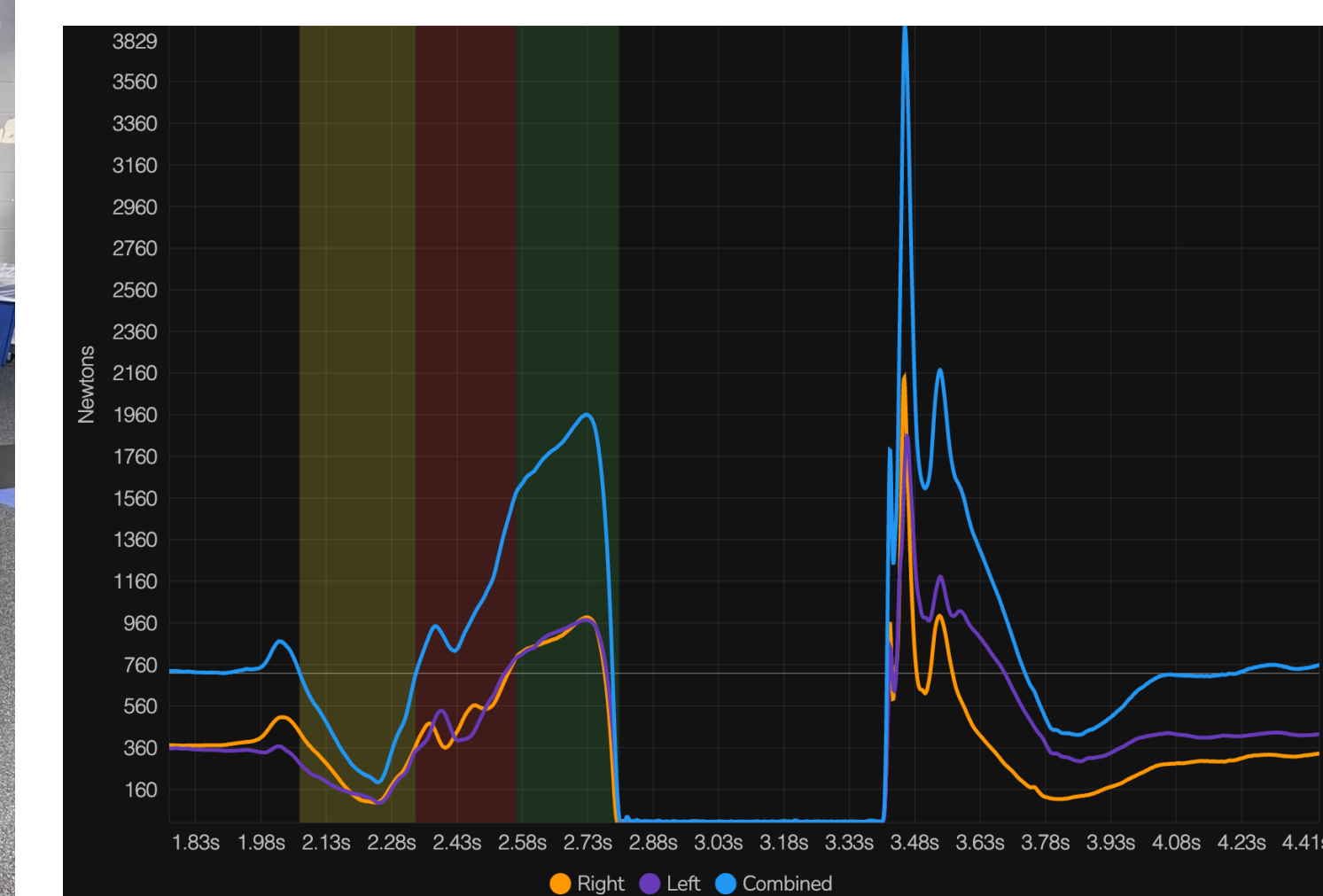
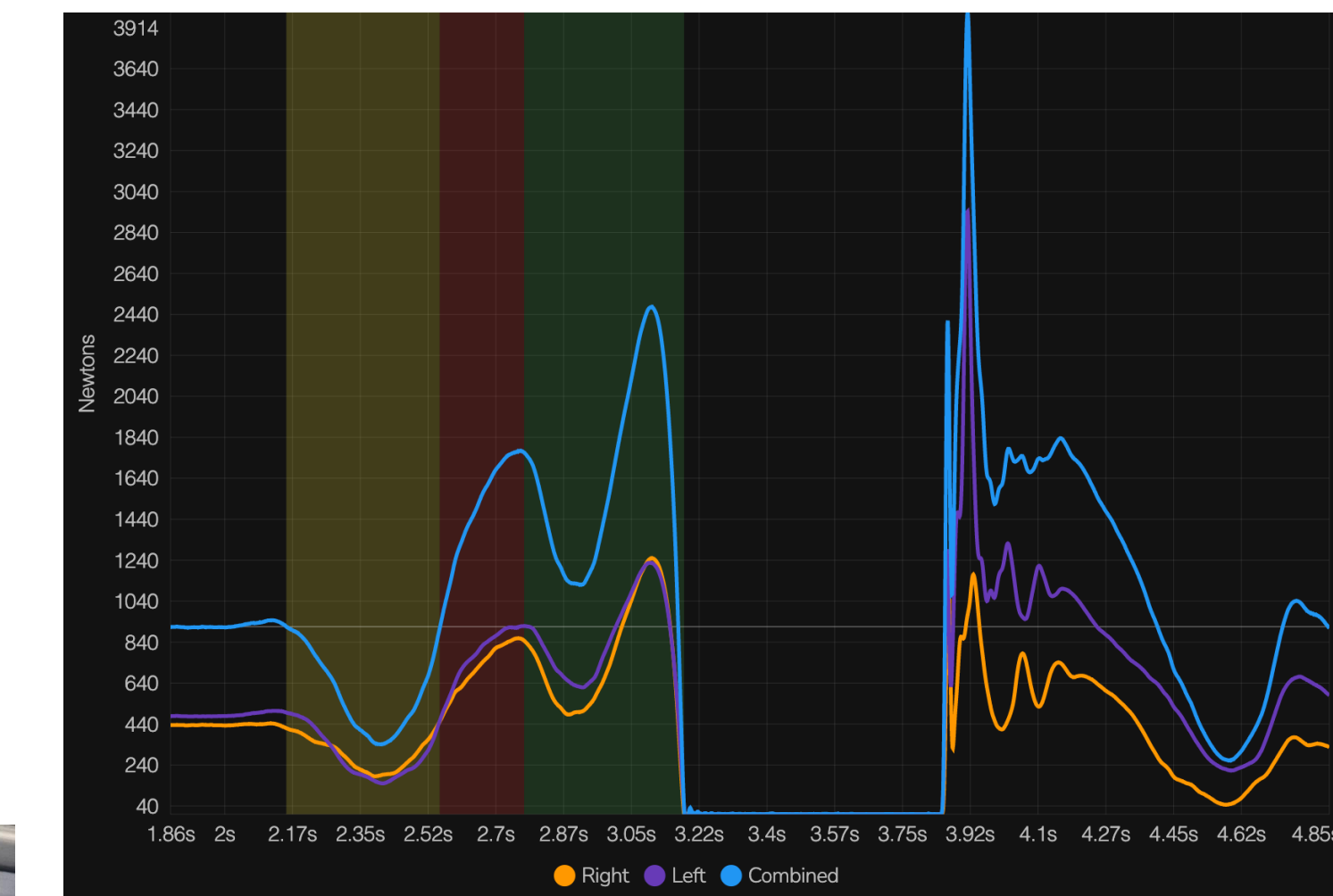
Women's

- Tendon Stiffness ($p = 0.729$)



RESULTS

- Shown here is what a CMJ assessment looks like on the tablets run for the force plates.
- There is an assessment from standout athletes on both the men's (top) and women's (bottom) basketball teams



DISCUSSION

- For both sexes, takeoff velocity, relative propulsive net impulse, and peak relative propulsive power had a strong relationship to jump height
- Regardless of sex, an athlete's ability to express force concentrically at the moment of takeoff directly correlates to the quality of jump and the height of the jump

CONCLUSION

- There are certain characteristics that contribute more significantly to jump height between both male and female basketball athletes.
- Some of the differences in characteristics can be impacted by injury, fatigue, physiological makeup, or biomechanical differences between individual athletes.
- This information can be utilized by performance staff to guide general and specific training approaches for enhancing athletic performance through the development of muscular strength and power relative to an athlete's needs.