

COUNTERMOVEMENT JUMP PERFORMANCE AND THE IMPACT OF A COMPETITIVE VOLLEYBALL SEASON

¹M.G. Phillips, ²A.A. Burke, and ¹T.J. Suchomel
¹Carroll University, Waukesha, WI
²George Mason University, Fairfax, VA

Introduction

Countermovement jumps (CMJs) are commonly used in training programs, research, and performance monitoring to assess jump height among many other variables related to power output. Pre- and post-season testing periods offer the opportunity to monitor fitness characteristics of athletes in a competitive season. This testing may provide valuable information to sport scientists, strength and conditioning practitioners, and sport coaches. The comparison of test period results provide a way of assessing individual athlete or team performance with data to evaluate the success of training methodologies. Women's volleyball is a sport requiring repetitive jumping, challenging the ability to maintain performance over the course of a competitive season.

CMJs are typically used to evaluate explosive force production ability, identifying strengths and weaknesses of an athlete; it also allows for measurement of training progress (2). Many studies have shown the extensive number of variables that impact CMJ performance. A specific study by Cormack et al. (1) analyzed jump height, flight time, peak power, relative peak power, mean power, relative mean power, peak force, and relative peak force to assess their reliability. The purpose of this study was to examine in-season changes in CMJ force-time characteristics in National Collegiate Athletic Association (NCAA) Division III female volleyball players.

Methods

- 17 NCAA Division III female volleyball completed two CMJ testing sessions during the competitive season as part of a long-term athlete monitoring program.
- Athletes age: 19.6 ± 1.0 years, body mass: 70.6 ± 11.3 kg, height: 174.0 ± 6.5 cm
- The first testing session took place in the first week of the season while the second took place during the final week. During each testing session, each subject completed a standardized dynamic warm-up before performing two maximal effort CMJ trials.
- Each CMJ trial was performed on dual force plates and the force-time data were used to calculate jump height and propulsion mean force, velocity, and power.
- The average performance between CMJ trials during each testing session were used for statistical comparison.
- A series of paired-samples t-tests were used to examine the in-season changes in CMJ force-time characteristics.
- Hedge's *g* effect sizes were calculated to determine the magnitude of change between testing sessions.

Methods



Figure 1. Countermovement jump testing performed on force plates.

Results

- There were statistically significant decreases in CMJ height ($p = 0.037$) and mean velocity ($p = 0.022$).
- The differences between beginning and end of season CMJ mean force ($p = 0.686$) and mean power ($p = 0.079$) were not statistically significant.
- The changes in CMJ height, mean velocity, and mean power were small while the change in mean force was trivial.

Table 1. Beginning and end of season countermovement jump performances (mean \pm SD).

	Jump Height (m)	Mean Force (N/kg)	Mean Velocity (m/s)	Mean Power (W/kg)
Beginning	$0.31 \pm 0.05^*$	18.1 ± 1.5	$1.49 \pm 0.11^*$	25.0 ± 3.5
End	0.29 ± 0.04	18.1 ± 1.5	1.44 ± 0.09	24.0 ± 2.9
<i>g</i>	-0.54	-0.04	-0.55	-0.31

* = significantly different from end of season testing; *g* = Hedge's *g* effect size magnitude between beginning and end of season testing

Conclusions

- There was a decrease in CMJ height, mean velocity, and mean power from the beginning to the end of the competitive season.
- The changes in performance were trivial to small indicating that they may not be practically meaningful.

Practical Applications

- Consistent in-season CMJ testing may provide strength and conditioning practitioners with some insight into how a team is adapting to competition stress.
- The current results indicate that the volleyball team on average, showed small decreases in their explosive strength characteristics as indicated by their changes in jump height, mean velocity, and mean power.
- The team was also able to maintain their propulsive mean force characteristics, demonstrating a maintenance of strength.
- Although the current study examined the changes in team performance, it is important to monitor individual player changes as well. In doing so, practitioners may be able to prescribe effective training stimuli to maintain or improve performance characteristics throughout a competitive season.

References

- Cormack SJ, Newton RU, McGuigan MR, Doyle TL. Reliability of measures obtained during single and repeated countermovement jumps. *Int J Sports Physiol Perform* 3: 131-144, 2008.
- Sha, Z., Zhou, Z., & Dai, B. (2021). Analyses of Countermovement Jump Performance in Time and Frequency Domains. *J Hum Kinet* 78, 41-48



mphilip@carrollu.edu

