Differences in Countermovement Jump Kinetics Before and After a Collegiate Beach Volleyball Season

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ABSTRACT

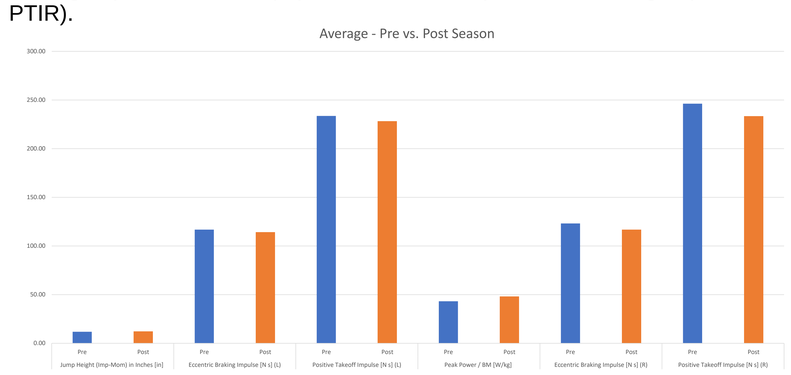
Competitive beach volleyball incorporates motion through all planes with an emphasis on vertical jumps for spikes and blocks. Working towards developing strength and conditioning programs that best benefit these athletes is vital in performance on and off the court to prevent injury. The countermovement jump (CMJ) test is widely used with athletes to look at factors of performance, neuromuscular fatigue, and injury prevention. Combined, these metrics allow strength and conditioning professionals to see progress throughout a season, and alter programming based on the individualized results. **PURPOSE:** The purpose of this study was to retrospectively analyze CMJ data pre and post a competitive season. **METHODS:** Twenty Division I collegiate beach volleyball student-athletes (20.25 ± 1.3 yrs, 1.75 ± .06 m, 66.12 ± 4.94 kg) performed a series of 3 bilateral CMJs prior to the start of the season and following the end of the season on force plates. Each athlete was instructed to stand still to calibrate and obtain current body weight in kg, then to jump as high as possible with a moment to rest and reset before the next jump. The following metrics were included in this analysis: Jump height (JH), peak power (PP), eccentric braking impulse left and right (EBIL and EBIR), positive takeoff impulse left and right (PTIL and PTIR). **RESULTS:** Paired sample t-tests were completed to determine significant effects when comparing pre and post season data for JH, PP, EBI, and PTI. There were statistically significant increases in JH (p=.02) and PP (p=.03). On the other hand, there were no statistically significant differences noted in EBI on either left or right sides (p=.21 and p=.07, respectively) or in PTI on either left or right sides (p=.21 and p=.07, respectively). **CONCLUSIONS:** These results suggest that strength and conditioning coaches should emphasize concentric power movements for collegiate beach volleyball players to increase their jump height, compared to the eccentric movements. EBI and PTI both decreased throughout the season which adds to jump efficiency by reducing time and maximizing force in the stretch-shortening cycle. **PRACTICAL APPLICATION:** Understanding the effects of a season on force production during countermovement jumps is an integral component to monitoring athlete readiness, performance, risk of injury and fatigue. Incorporating CMJs and techniques that maximize jump efficiency while increasing power could provide additional information to strength and conditioning professionals and athletes about their readiness and performance. Limiting eccentric movements and working more in the realm of concentric power, power and jump height should both see an increase for these athletes in the future.

INTRODUCTION

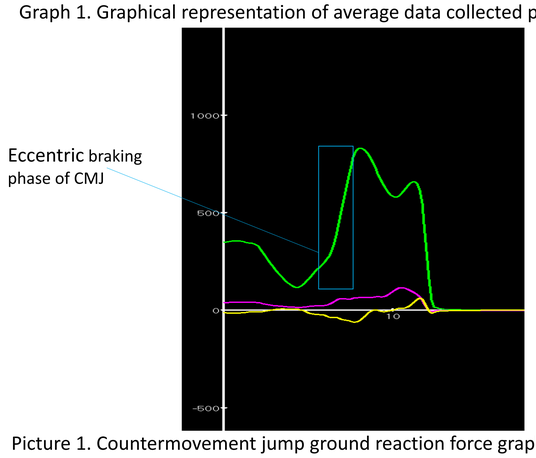
The sport of beach volleyball is continuing to expand in the NCAA and provides strength elements that are tested every play through the specific element of the sand. Managing to reach maximal jump height consistently and covering an entire court with two players requires power and speed to be always tuned. The importance of maintaining and progressing, while monitoring for injury is instrumental in this case to allow for constant evaluation throughout the season. Emphasizing movements that can help these athletes progress to peak performance in season is vital, especially given the uneven terrain and continuous play during sets. Utilizing countermovement jump (CMJ) testing throughout the season can provide metrics to monitor performance and injury prevention to alter programming throughout the course of the season.

METHODS

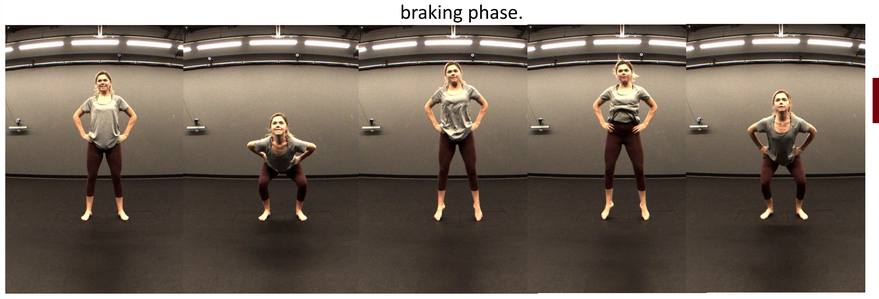
Twenty female Division I collegiate beach volleyball student-athletes (20.25 ± 1.3 yrs, 1.75 ± .06 m, 66.12 ± 4.94 kg) performed a series of 3 bilateral CMJs prior to the start of the season and following the end of the season on force plates. Each athlete was instructed to stand still to calibrate and obtain current body weight in kg, then to jump as high as possible with a moment to rest and reset before the next jump. The following metrics were included in this analysis: Jump height (JH), peak power (PP), eccentric braking impulse left and right (EBIL and EBIR), positive takeoff impulse left and right (PTIL and PTIR).



Graph 1. Graphical representation of average data collected pre and post season.



Picture 1. Countermovement jump ground reaction force graph with emphasis on eccentric braking phase.



Picture 2. Five key phases of countermovement jump utilized upon analysis.

RESULTS

Paired sample t-tests were completed to determine significant effects when comparing pre and post season data for JH, PP, EBI, and PTI. Mean and standard deviation for these metrics are found in Table 1. There were statistically significant increases in JH (p=.02) and PP (p=.03). On the other hand, there were no statistically significant differences noted in EBI on either left or right sides (p=.21 and p=.07, respectively) or in PTI on either left or right sides (p=.21 and p=.07, respectively).

CONCLUSION

These results suggest that strength and conditioning coaches should emphasize concentric power movements for collegiate beach volleyball players to increase their jump height, compared to the eccentric movements. Movements such as deadlifts, high pulls, and step ups work to focus more on the concentric components, rather than the muscle lengthening. EBI and PTI both decreased throughout the season which adds to jump efficiency by reducing time and maximizing force in the stretch-shortening cycle. This explosiveness is essential to maintain given the sand courts through increasing the power and jump height, overall.

PRACTICAL APPLICATION

Understanding the effects of a season on force production during countermovement jumps is an integral component to monitoring athlete readiness, performance, risk of injury and fatigue. Incorporating CMJs and techniques that maximize jump efficiency while increasing power could provide additional information to strength and conditioning professionals and athletes about their readiness and performance. The focus placed more on these concentric movements has the potential to decrease risk of injury due to lesser time spent on the eccentric phases, while implementing the power focus towards maximal performance benefit. Limiting eccentric movements and shifting focus to the realm of concentric power, should increase power and jump height for these athletes in the future.

CONTACT INFORMATION

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