Benchmarking Physical Performance Measurements in Division III Women's Lacrosse: A Preliminary Analysis

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Introduction

Lacrosse is a field sport which demands coordination, agility, and speed of each athlete. Consisting of high intensity bouts of sprinting, cutting, and decelerating. Additionally, lacrosse requires a high aerobic and anaerobic capacity (1). More than 24,341 athletes participate in NCAA lacrosse and each athlete requires both lower and upper body speed and power to be successful. The unloaded countermovement jump (CMJ), 20m sprint and single arm seated shot-put are three measurements that can assess the performance qualities in female lacrosse athletes. Benchmarking key physical performance metrics between athletes and teams is one method of monitoring athletic performance (2). Research within women's lacrosse is limited, this research aimed to benchmark physical performance metrics within Division III NCAA women's lacrosse. This research can aid in program design and athlete progression throughout their NCAA career.

Methods

- This retrospective analysis included 66 NCAA Division III female lacrosse athletes (age = 19.5 ± 1.0 years, height = 163.8 ± 5.5 cm, body mass = 67.7 ± 13.3 kg) who competed during the 2022 and 2023 seasons.
- Each athlete performed pre-season unloaded CMJ, 20m sprint, and seated single-arm shot put (SPT) testing as part of a long-term athlete monitoring program.
- CMJ height was calculated based on take-off velocity using raw force-time data. 20m sprint times were performed starting in a two-point, staggered position on an indoor track surface and recorded using laser timing gates. SPT testing was performed using a 4lb medicine ball and the distances were measured using a measuring tape.
- Two trials of each test were performed with the average performance being used for statistical analysis.
- Following testing, the mean and standard deviation of each test were determined prior to calculating Z-scores and T-scores for each athlete.
  - Z-scores were calculated by dividing the difference between an athlete's score and the group mean by the group standard deviation.
  - Individual T-scores were then calculated by multiplying the Z-scores by 10 and adding 50.
- The T-scores were used to create benchmarking bands for each performance test.

Results

Description	T-score	CMJ Height (cm)
Excellent	80	>34
Good	70	29 – 34
Above Average	60	25 – 29
Average	50	21 – 25
Poor	40	16 – 21
Very Poor	30	12 – 16
Extremely Poor	20	<7 - 12

Figure 1. T-score bands and qualitative descriptions of countermovement jump height data.

Description	T-Score	20m Sprint (s)
Excellent	80	≤2.9
Good	70	2.9 – 3.3
Above Average	60	3.3 – 3.6
Average	50	3.6 – 4.0
Poor	40	4.0 – 4.3
Very Poor	30	4.3 – 4.7
Extremely Poor	20	4.7 - ≥5.0

Figure 2. T-Score bands and qualitative descriptions of 20m sprint data.

Description	T-Score	Shot-put Throw (cm)
Excellent	80	≥495
Good	70	445 – 495
Above Average	60	395 – 445
Average	50	344 – 395
Poor	40	294 – 344
Very Poor	30	243 – 294
Extremely Poor	20	<193 – 243

Figure 3. T-Score bands and qualitative descriptions of single arm seated shot-put data.

Conclusions

- The creation of performance benchmark bands is a simple process that only requires the mean and standard deviation of a performance test for a given team and a few minor calculations.
- The current results provide preliminary CMJ, 20m sprint, and SPT performance bands for NCAA Division III female lacrosse players.

Practical Applications

- Performance benchmarks may be used by sport scientists, strength and conditioning practitioners, and coaches to understand what physical characteristics certain athletes may need to improve on.
- Once benchmarks are established, longitudinal monitoring can be implemented to set new benchmarks over time.
- While the current performance bands are preliminary, further research is needed to determine standards across the entirety of Division III athletics as well as other divisions.

References

1) Enemark-Miller EA, Seegmiller JG, Rana SR. Physiological profile of women's Lacrosse players. J Strength Cond Res 23: 39-43, 2009.
2) McMahon JJ, Ripley NJ, Comfort P. Force plate-derived countermovement jump normative data and benchmarks for professional Rugby League players. Sensors 22: 8669, 2022.

Figure 4. Seated single-arm shot-put throw.

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