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Relationship of Functional Test Performance with Sport Proficiency in High School Volleyball Players

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INTRODUCTION & PURPOSE

Understanding the relationships between functional performance tests and sport performance is important for sport coaches and trainers. The purpose of this study was to examine upper body and lower body functional tests, range of motion, and biomechanics and their impact on volleyball proficiency in female club-volleyball players of high school eligibility who play at least 6-9 months out of the year. Three main criteria were hypothesized to depict a relationship with functional test performance:

- (1) Level-of-play: National standing vs American standing
- (2) Position: Primary overhead positions (hitter/attacker) vs Non-overhead positions (libero, defensive specialist, setter, utility)
- (3) iLESS: Good score (0) vs Bad score (1)

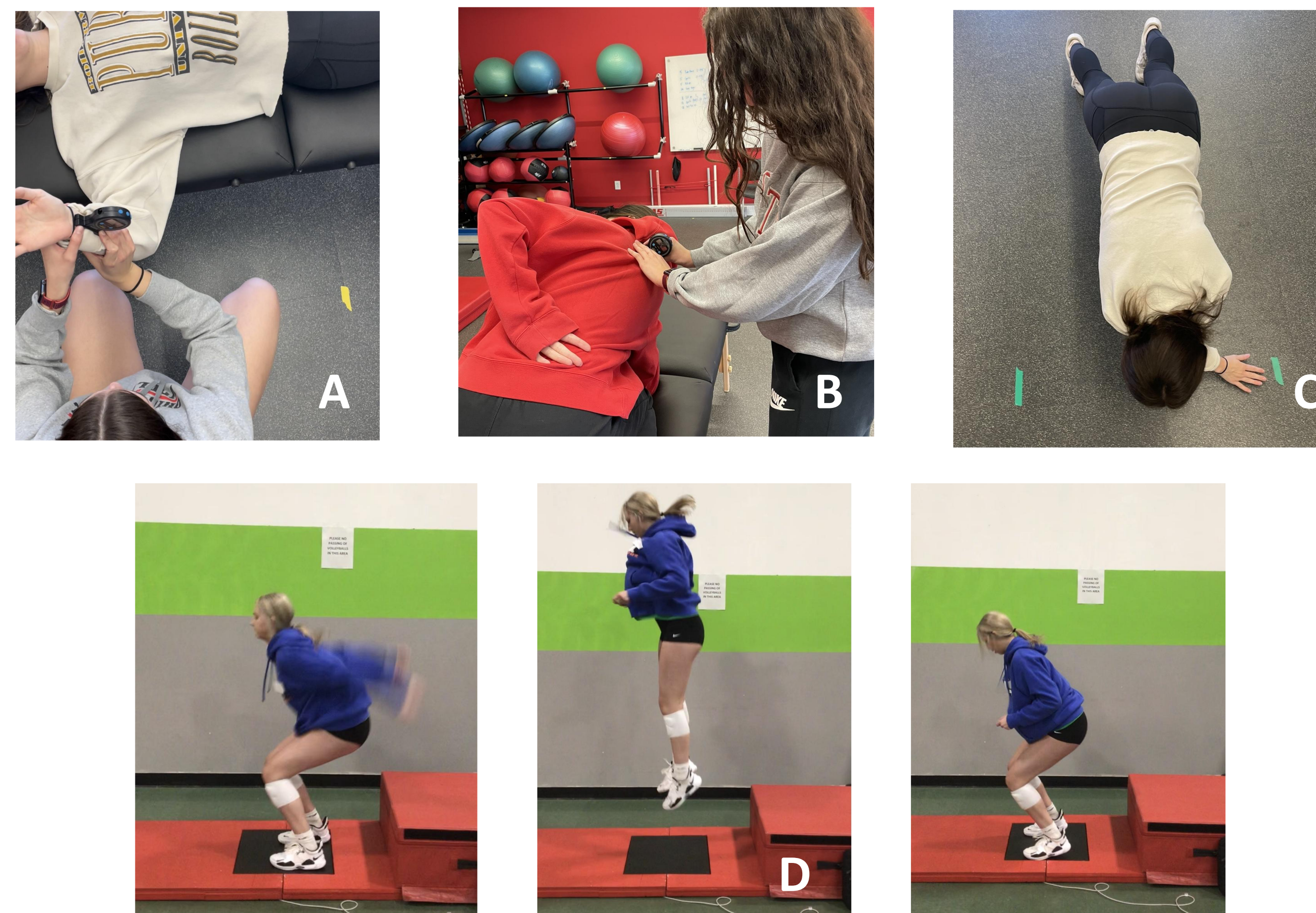
In order to understand these relationships, participants were asked to perform several assessments and were scored in the following criteria:

- Shoulder internal and external range of motion
- Lumbar-locked thoracic rotation
- The Davie's closed kinetic chain (DCKC) test
- Grip strength
- i-Landing error scoring system (iLESS)

METHODS

- Prior to testing, consent forms were collected from all eligible participants. Upon arrival on testing days, participants were asked to complete a general information questionnaire regarding playing history and health status.
- Shoulder INT and EXT rotation was measured in the dominant arm by a digital goniometer, with participants lying supine on a flat table (Image A). Lumbar-locked thoracic rotation was measured on the left and right side using a digital inclinometer to analyze transverse range of motion in the thoracic region (Image B).
- The Davie's closed kinetic chain (DCKC) test was administered to examine shoulder stability. Two pieces of tape were placed 36 inches apart and participants were asked to hold a push-up position while tapping each piece of tape back and forth for fifteen seconds (Image C).
- Grip strength in the dominant and non-dominant hands were measured using a hand-held dynamometer.
- The i-Landing error scoring system (iLESS) evaluated participants on a jump-landing task, where they stepped off a 30-cm box, landing with both feet on a force plate and explosively jumped as high as possible into the air, and were graded as good (0) or bad (1) jumping patterns (Image D).

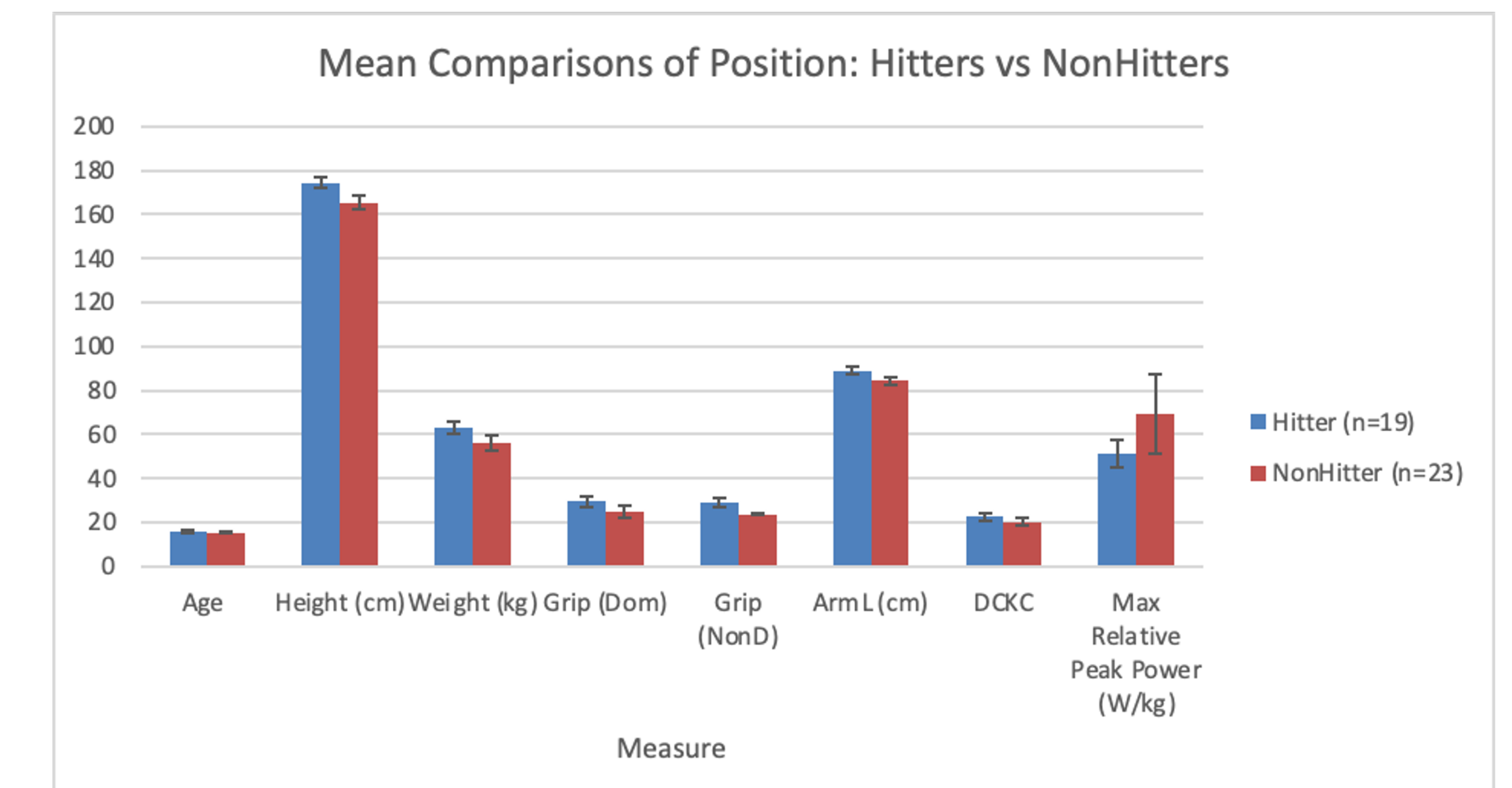
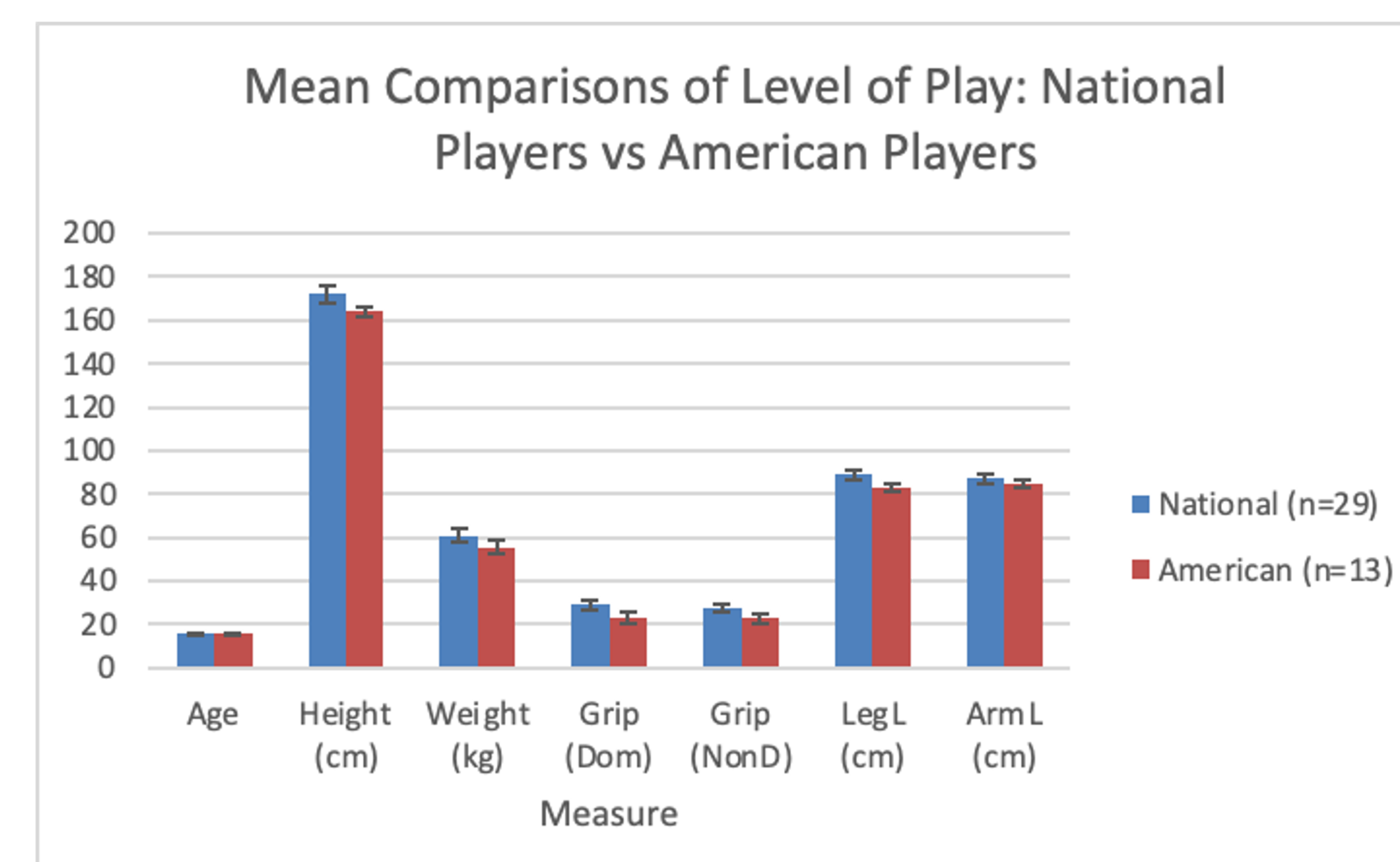
TESTING



SUBJECTS

- Forty-three female volleyball players from two clubs in Columbus, OH were recruited to participate. Inclusion criteria required participants to be of high school eligibility, and participants were excluded if they sustained a recent injury that resulted in 4 or more weeks of missed sport participation.
- Participants varied by level-of-play: National (n=29), American (n=13) and by position: Hitters (n=19), Non-Hitter (n=23).

RESULTS



Independent samples *t*-tests were used to compare all three criteria. Comparing level-of-play, National players demonstrated significantly greater height ($p = 0.001$, $d = 1.17$); weight ($p = 0.015$, $d = 0.85$); grip strength ($p = 0.001$, $d = 1.16$); arm length ($p = 0.027$, $d = 0.66$); and leg length ($p = 0.003$, $d = 1.39$). Comparing position, hitters/attackers demonstrated significantly greater height ($p < 0.001$, $d = -1.51$); weight ($p < 0.001$, $d = -1.11$); arm length ($p < 0.001$, $d = -1.30$); grip strength ($p = 0.01$, $d = -0.82$); DCKC ($p = 0.019$, $d = -0.76$); and Max Relative Peak Power ($p = 0.015$, $d = 0.66$). There were no other significant differences among the tested variables or criteria.

CONCLUSIONS

National level players demonstrated greater height, weight, dominant and non-dominant grip strength, leg length, and arm length when compared to American level players. Hitters demonstrated significantly greater height, weight, arm length, dominant and non-dominant grip strength, DCKC scores, and maximal relative-peak power in the drop jumps when compared to non-Hitters. The sample of forty-three athletes was not large enough to confirm or generalize results to a larger population; however, these results demonstrate no appreciable differences in lower body explosiveness between group criteria.

PRACTICAL APPLICATIONS

Several relationships exist between functional performance tests and volleyball sport performance. One trend noted for future research was in the iLESS test. iLESS scores of (1) identify athletes with greater injury-risk in the lower extremity when graded on landing mechanics. In this study, comparing Good iLESS scores (n=5) to Bad iLESS scores (n=35), significant differences were found in rate of power development and relative peak power. This finding supports the relationship between quality of jumping mechanics and quantity of power/force metrics, and needs to be investigated further with additional athletes.