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### Is There A Single Set Of Biomechanical Variables That Predicts Jump Performance?

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*Abstract:*

Vertical jump performance is an important variable related to high level function in athletics. Vertical jump height can, however, be a product of different scenarios associated with the center of mass acceleration and foot position, all of which require different strategies to maximize jump performance.

**PURPOSE:** To determine if there is a single set of biomechanical variables that can predict vertical jump height during multiple jumping strategies: single foot jump, drop jump and countermovement jump.

**METHODS:** Three dimensional kinematics and kinetics were collected during three different jumping tasks in fifty recreational male athletes who had a history of high level participation in jumping sports. Exclusion criteria were any injury in the past 6 months or any prior lower extremity surgery. Three successful trials were analyzed for single foot, drop jump and countermovement jumps. Athletes were instructed to jump as high as possible; testing order was randomized to minimize fatigue effects. The dominant limb was used for analysis across all three jumping strategies. Discrete kinematic and kinetic variables were extracted from the ensemble curves for analysis. All of the discrete variables were correlated to jump height and the ten variables that had the strongest correlation were inserted into a linear regression model to identify what variables predicted maximum jump height.

**RESULTS:** There was no single set of variables that predicted jump height across all three jumping tasks. Performance on the one foot jump was predicted by peak knee power, peak hip extension moment, peak knee extension velocity, and the percentage of the trial when peak knee flexion velocity occurred ( $r^2 = 0.58$ ). Performance on the countermovement jump was predicted by peak hip power, ankle range of motion and knee range of motion ( $r^2 = 0.65$ ). Performance on the drop jump was predicted by the peak vertical ground reaction force and the percentage of the trial when the peak hip velocity occurred ( $r^2 = 0.37$ ).

**CONCLUSIONS:** A single set of variables was not identified that could predict jump performance across different types of jumping tasks. This may warrant additional variables or combinations of variables (couplings) to identify singular variables or sets of variables that identify peak jump performance.

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