MCCLEAN PERFORMANCE STRENGTH PREDICTOR TOOL

Testing Protocols and Data Processing Protocols and Guidelines

Testing Protocol Overview and Cueing Strategies

Table 1: Force Plate Testing Protocols.

Force Plate Test	Abbreviation	Protocols and Cues
Body mass countermovement jump test	CMJ	- CMJ testing is conducted on a dual force plate system with one foot place on each force plate. - Hands placed firmly on hips. -5 isolated CMJs are performed with a 5s quite standing period between each jump. - **Cue:** Jump as high as possible
Countermovement jump with an external load equal to 30% of the athlete's body mass test	CMJ + 30% BM load	- CMJ + 30% BM load testing is conducted on a dual force plate system with one foot place on each force plate. - Hands are used to grip hexagonal bar (i.e., trap bar) with a total weight equal to 30% of the athlete's body mass. -3 isolated jump trials are performed with a 5s quite standing period between each jump. - **Cue:** Jump as high as possible
Countermovement jump with an external load equal to 60% of the athlete's body mass test	CMJ + 60% BM load -The lobal assessment of Neuromuscular Performance Tool uses the abbreviation "*Loaded CMJ*" as data from the CMJ + 30% BM load testing protocol is not included in this tool.	- CMJ + 60% BM load testing is conducted on a dual force plate system with one foot place on each force plate. - Hands are used to grip hexagonal bar (i.e., trap bar) with a total weight equal to 30% of the athlete's body mass. -3 isolated jump trials are performed with a 5s quite standing period between each jump. - **Cue:** Jump as high as possible

Data Processing Notes

The Maximal Lower Limb Strength Prediction Tool does not require data to be body mass normalized and selecting the best (i.e., maximum) value for all relevant testing metrics is encouraged to provide a better indicator of maximal strength capacities.

Table 2: Data processing guidelines and definitions.

Metric	Relevant Tests	Biomechanical Definition	Practical Relevance	Units
System mass	Body weight CMJ; CMJ + 30% BM load; CMJ + 60% BM load	The total ground reaction force obtained from the left and the right force plate during the 5s quiet standing period prior to initiating a CMJ or the first repeated hop.	Most often this value is equal to the athlete's body mass. However, in cases of CMJ testing with an additional external load, the system mass is equal to the sum of the body mass and the external load.	Kg
CMJ eccentric deceleration (braking) movement phase	This is not a direct metric, but used in the calculation of below metrics	A movement phase defined from the point of maximal downward velocity to the instant where the body's center of mass reaches a velocity of 0 m/s.	Defines the eccentric deceleration movement phase which is critical to a phase-based analysis of the countermovement jump.	---
CMJ concentric (propulsive) movement phase	This is not a direct metric, but used in the calculation of below metrics	A movement phase defined from where the body's center of mass reaches a velocity of 0 m/s to the instant of toe-off.	Defines the concentric movement phase which is critical to a phase-based analysis of the countermovement jump.	---
CMJ eccentric deceleration phase total impulse	CMJ + 60% BM load	The area (i.e., impulse) under the force-time curve during the eccentric deceleration phase.	This value is not body weight normalized and is used as a predictor within the maximal absolute eccentric strength model.	Ns
CMJ concentric phase total impulse	CMJ + 60% BM load	The area (i.e., impulse) under the force-time curve during the concentric phase.	This value is not body weight normalized and is used as a predictor within the maximal absolute concentric strength model.	Ns
Take off velocity; TOV	Body weight CMJ; CMJ + 30% BM load; CMJ + 60% BM load	TOV is obtained using the impulse momentum method and is equivalent to the system mass normalized, net impulse during the concentric movement phase.	Directly determines jump height and can be used to monitor improvements in vertical CMJ performance.	m/s
Maximal downward velocity	CMJ + 60% BM load	The minimum value obtained from the velocity-time curve. This instant defines the onset of the eccentric deceleration phase. The absolute value (a positive number) is used for analysis.	Reflects the CMJ unloading strategy. A faster value requires greater eccentric strength to control and reverse the CMJ movement. This capacity is often limited after lower body injury.	m/s

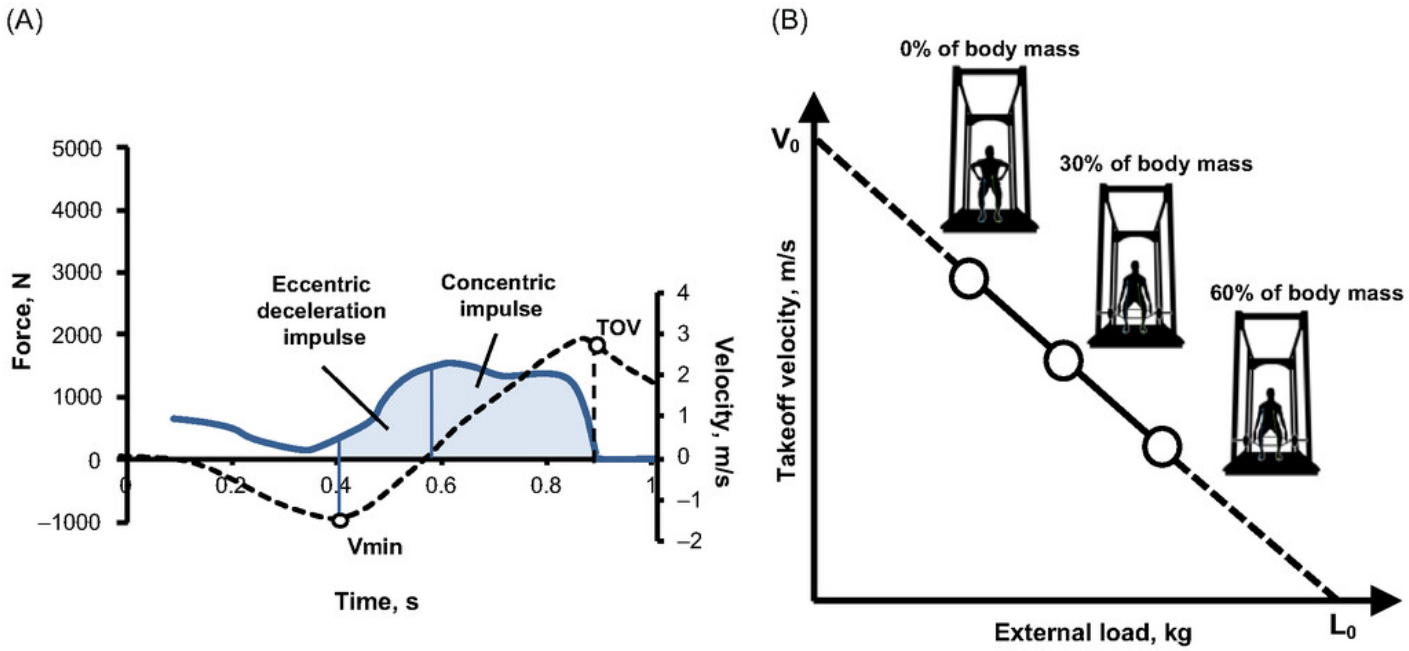

Figure 1: A) A visual representation of countermovement jump force-time curve points and phases of interest. B) visual representation of load-velocity profile utilized within prediction of maximal lower body strength. Figure is obtained from McClean ZJ, McKenzie M, Zukowski M, et al. Predicting Multijoint Maximal Eccentric and Concentric Strength With Force-Velocity Jump Mechanics in Collegiate Athletes. *International Journal of Sports Physiology and Performance*. 2025;1(aop):1-12. doi:10.1123/ijspp.2024-0439