

Quantifying Getting High Under One's Own Power – A Comparison of Vertical Jump Height Measurement Methods

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ABSTRACT

Countermovement jump (CMJ) height is widely used as a performance test, but the methods for assessing jump height are not standardized. Some assessment methods include the use of aerial time, take-off velocity or jump and reach systems such as the Vertec commonly seen in the NFL combine. The Vertec tests an athlete's vertical jump by having the athlete jump and reach for the highest rotating vane they can tap with their hand. However, the validity of these different methods is not well established even though the governing force-motion relationships have been known for centuries. Specifically, motion of the body's center of mass (COM) is determined by the vertical impulse (force x Δ time) prior to take-off. At present, the agreement, or lack thereof, between the commonly used field assessment methods and the actual height the COM attains during a CMJ is not known. Here, we hypothesized that body positional changes during jump and reach tests result in jump height overestimations. **PURPOSE:** To compare one of the most widely utilized field methods, the Vertec to the gold standard of impulse determined jump height. **METHODS:** Thirty total (n=15 male, n=15 female) participants ranging in athletic ability from recreational to competitive collegiate level athletes completed three maximal effort CMJs. Jump height was determined simultaneously from the impulse collected using Bertec force plates and a Vertec system. Only the athlete's highest jump was used in analysis. Vertec and impulse determined jump heights were compared using paired samples t-tests, with alpha level set at 0.05. **RESULTS:** Vertec jump heights significantly exceeded impulse determined jump heights by an average of 14 cm: 54 ± 14 vs. 40 ± 11 cm ($P < 0.001$) respectively. [Vertec range: 32 to 81 cm; Impulse range: 23 to 59 cm.] **CONCLUSION:** The Vertec measurement system appreciably overestimates the elevation of the body's COM during vertical jumping, here by an average of 14 cm or 5.5 inches. There was also a trend for individuals with higher jump heights to have a greater difference between the two measurements. Suggesting that reaching ability may be more of a determinant of Vertec jump height than vertical impulse. This should be of interest to sports performance professionals that use this method to analyze progress. This disparity in quantification exists because the difference between standing and reaching hand height at jump apex over-represents the vertical elevation of the COM. This phenomenon is most likely to result from the asymmetrical nature of the reaching action as athletes strike the Vertec vanes. It is also important for sport performance professionals that use the Vertec method to recognize that their athlete's do not jump as high as they currently believe.