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Activity: Scientific Abstract
Current Date/Time: 10/26/2021 1:46:28 PM

Vertical Jump Height And Mechanical Power: Association Is Much Worse Than Previously Documented

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Abstract:
Despite comments and warnings in different publications, jump height is widely used to predict power in humans. Training programs are designed and individual progress is often monitored on the basis of estimated power, but prediction equations are based on group data. **PURPOSE**: to show that vertical jump performance (VJP) and mechanical power are poorly associated, particularly within individuals. **METHODS**: Three young male subjects (VJP = 0.301±0.009m, 0.439±0.017m and 0.586±0.014m; mean±sd) performed 50 maximal jumps each on a force platform while kinematic data were collected at 60 Hz. Participants rested sitting for 1 minute after each jump. VJP was calculated for each jump from the kinematic data as peak body center of mass (BCOM) minus standing BCOM; peak and average mechanical power (PEAKPWR and MEANPWR, respectively) were calculated for the same jumps from the vertical ground reaction force. Regression analyses were performed using standardized VJP scores as the predictor variable and standardized PEAKPWR or MEANPWR scores as the resulting variable, expecting an identity function of y = x (intercept = 0, slope = 1 and r^2 = 1). **RESULTS**: Individual PEAKPWR = 2079.3±56.6W, 3706.0±136.1W, and 4085.0±74.2W (mean±sd). Individual MEANPWR = 1313.6±52.8W, 2124.1±117.1W, and 2485.9±123.9W. Model *zPEAKPWR = k + s(zVJP) + subject + Error* showed an excellent r^2 = 0.96, but the slope (0.428) was significantly different from 1 (p=4.4E-5). Model *zMEANPWR = k + s(zVJP) + subject + Error* showed an excellent r^2 = 0.99, but the slope (0.201) was significantly different from 1 (p=4.3E-20). Individual models for zPEAKPWR all showed slopes significantly different from 1 (p<0.001): 0.274, 0.253, and 0.128, the latter not even different from 0 (p=0.43); corresponding r^2 = 0.16, 0.10, and 0.01. Individual models for zMEANPWR all resulted in slopes significantly different from 1 (p≤0.01): 0.307, 0.597, and 0.465, with only 0.597 being significantly different from 0; corresponding r^2 = 0.02, 0.21, and 0.08. **CONCLUSION**: Regression analysis for individuals shows that VJP is a poor predictor of mechanical power. Whenever mechanical power results are necessary, they should be obtained directly with the use of a force platform. Jump height results should be reported, analyzed, and interpreted only as vertical jump performance.

Author Disclosure Information:

L.F. Aragón-Vargas: None.
Category (Complete): 408. Biomechanics and Neural Control of Movement - other ; 402. Biomechanics and Neural Control of Movement - sport biomechanics
Keyword (Complete): Athlete testing ; Power testing ; Regression models
Unlabeled/Disclosure (Complete):
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