Rate of Force Development, Net Impulse and Modified Reactive Strength as Predictors of Volleyball Spike Jump Height among Young Elite Players

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Abstract : Force-time (F-T) curvature characteristics are globally referenced as the main indicators of athletic jump performance. Nevertheless, to the best of authors' knowledge, no investigation tried to deeply study the relationship between F-T curve variables and real-game jump performance among elite volleyball players. To this end, this study was designated to investigate the association between F-T curve variables, including movement timings, force, velocity, power, rate of force development (RFD), modified reactive strength index (RSImod), and net impulse with spike jump height during real-game circumstances. Twelve young elite volleyball players performed 3 countermovement jump (CMJ) and 3 spike jump in real-game circumstances with 1-minute rest intervals to prevent fatigue. Shapiro-Wilk statistical test illustrated the normality of data distribution, and Pearson's product correlation test portrayed a significant correlation between CMJ height and peak RFD (0.85), average RFD (r=0.81), RSImod (r=0.88) and concentric net impulse (r=0.98), and also significant correlation between spike jump height and peak RFD (0.73), average RFD (r=0.80), RSImod (r=0.62) and concentric net impulse (r=0.71). Multiple regression analysis also reported that these factors have a strong contribution in predicting of CMJ (98%) and spike jump (77%) heights. Outcomes of this study confirm that the RFD, concentric net impulse, and RSImod values could precisely monitor and track the volleyball attackers' explosive strength, muscular stretch-shortening cycle function efficiency, and ultimate spike jump height. To this effect, volleyball coaches and trainers are advised to have an in-depth focus on their athletes' progression or the impacts of strength trainings by observing and chasing the F-T curve variables such as RFD, net impulse, and RSImod.

Keywords : net impulse, reactive strength index, rate of force development, stretch-shortening cycle

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1