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Utilizing Vertical Sensors In Collegiate Volleyball Landing Impact Force And Jump Height Analysis

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Utilizing VERT Sensors In Collegiate Volleyball Landing Impact Force and Jump Analysis

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Abstract

Wearable sensors can quantify jump height (JH) and landing impact (LI) during drop vertical jump (DVJ), countermovement jump (CMJ), and approach jump (AJ). Differences in performance and external load between jumping tasks may be valuable in athlete monitoring; therefore, the primary aim was to identify differences in JH and LI between jumping tasks in collegiate female volleyball athletes (n = 16). Two one-way repeated measure ANOVAs were used to identify differences between DVJ, CMJ, and AJ, for JH and LI, with additional insights from percent differences and effect size calculations. JH and LI were significantly different between all conditions, except LI between DVJ and CMJ. Although JH and LI were correlated between tasks, JH and LI were not found to be correlated across all tasks. Large effect sizes were noted for JH and LI between sport-specific (AJ) and functional (CMJ and DVJ) jumping tasks.
Post-hoc secondary data analyses revealed small effect sizes for all variables of interest between positions. Jumping tasks commonly used during conditioning do not result in the same performance outcome measures and can vary in mechanical loads. Using VERT sensors during various jumping tasks may enhance athlete monitoring, with specific applications to performance optimization and injury mitigation.

VERT Sensors Effectively Identify Differences in Collegiate Volleyball Athlete Jump Heights and Landing Impacts

Experimental Design and Methods

Participants

n = 16, 19 ± 1 years old, 1.76 ± 0.17 m, 75.5 ± 8.2 kg
8 ± 2 years of organized volleyball experience

Procedures

Specific instructions were given for all jumps; participants were familiar with completing all tasks in previous team conditioning sessions. For the DVJ condition, participants stood on a 0.54 m tall box and stepped off with one foot, landing simultaneously on two feet, and immediately completing a jump.

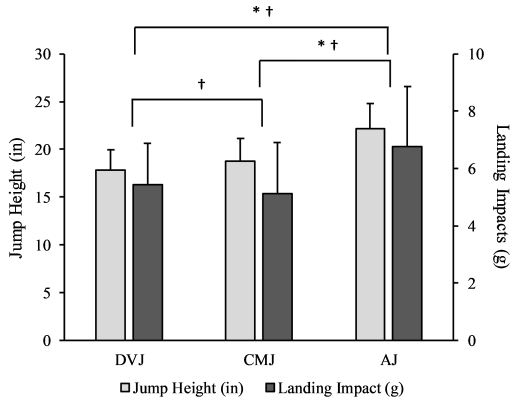
Application of sensors

VERT sensors were placed in an elastic band and fastened around the waist
Jump heights (JH) were calculated within the VERT Team System Basic application and exported after data collections were complete with coinciding timestamps.

Landing Impact vs Jump Height Findings

Pairwise comparisons of landings showed a significantly greater impact from the AJ compared to the CMJ ($p = 0.002$) and DVJ ($p = 0.003$), with no significant differences between CMJ and DVJ ($p = 0.918$) LI. There was a significant main effect of jumping tasks on JH ($p < 0.001$) and LI ($p < 0.001$). Subsequent pairwise comparisons revealed participants jumped significantly higher in the AJ compared to the CMJ ($p < 0.001$) and DVJ ($p < 0.001$).

Jump Height vs Landing Impact



Clinical Applications

The application of VERT sensors in volleyball and other court sports presents a new ability to continue this quantification and to analyze athletes both in practice and in a game situation. The real-time feedback with this technology can allow coaches and support staff to make rapid decisions in the players best interest or in a training situation, to adjust the workload accordingly.

Primary Aim

Identify how jump height interacts with landing impact forces and how those forces can be accurately quantified.

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