A COMPARISON OF VARIOUS METHODS FOR THE ASSESSMENT OF VERTICAL JUMP HEIGHT

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INTRODUCTION: The final result of the vertical jump (height of jump) is used both in research studies as well as in practice. The most frequent methods of assessing the height of a vertical jump are based on computations derived from the force-time curve (KISTLER, etc.). The comparison of the height of jump measured by KISTLER with the height of jumps measured and computed using other methods (e.g., Sargent jump, computation from time of non-contact phase, etc.) have resulted in differences among the values of the height of jump. The main goal of this paper is the comparison of various methods of computation of vertical jump height using kinetic and kinematic analysis.
METHODS: A group of 51 male physical education students (age: 18-24 years, height: 1.78 ± 0.07 m, body mass: 75.11 ± 6.54 kg) was the subject of the research. A countermovement jump (CMJ) with an arm swing was performed on a KISTLER platform and registered with two videocameras. One camera registered the subject in the frontal plane and the second registered the detail view of the ankle and foot from the lateral plane. By using a 2D kinematic analysis the track of the center of mass and the ankle were computed, and the heights of these points at different phases of the jump were evaluated. The heights of three selected anatomical points were also computed at different phases of the CMJ. The force-time function registered by the KISTLER platform was analyzed using software developed in our lab. The height of the jump, the height of the lift of the ankle and the time of the flight phase were evaluated. Ten different ways of computing the height of jump were used in this study. Statistical analysis was performed using the Statgraphics package (analysis of variance and correlation analysis).
RESULTS: Statistical analysis confirmed significant differences among the various methods of height of jump measurement. The KISTLER measured height of jumps was approximately 0.13 m lower than those measured by kinematic analysis. The height of the ankle is the main factor influencing this difference. The vertical lift of the anatomical point fossa jugularis resulted in almost the same values as the height of jump of the center of gravity measured by the kinematic analysis (height: center of mass = 0.59 m, ankle = 0.58 m). A very high level of correlation dependence among the measured values (r = 0.88-0.97) indicated the height accuracy of the methods used for the measurement of the height of the jump.
CONCLUSIONS: The results have shown that the measurement of the height of jump depends on the method used. The height of jump measured by the KISTLER platform is actually lower than in reality. The reason for these differences is the plantar flexion of the foot.