

THE INFLUENCE OF SAND SURFACE ON THE KINEMATICS OF VOLLEYBALL SPIKE JUMPS

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INTRODUCTION: Several types of sports, like soccer, European handball, and volleyball have expanded their classical fields of activity from indoor surfaces made of wood or synthetic and outdoor turf to sand surfaces. Previous studies reported differences in both body mechanics and energy demands during several types of movement on sand or similar compliant surfaces compared to hard surfaces. Therefore, we investigated the differences in kinematics during spike jumps performed on indoor or sand surface (Tilp et al., 2008).

METHODS: Eight male elite volleyball players performed spike jump movements on both surfaces. An eight camera motion capturing system (Vicon Peak, Oxford, UK, 250 Hz) was used to generate 3D kinematic data. Seven groups of variables representing the kinematics of the centre of mass, the countermovement, the approaching phase, and the angular amplitudes and maximal velocities of lower and upper limbs were tested for differences with Hotellings T_2^2 .

RESULTS: Significant differences ($p < 0.05$) were observed regarding the movement of centre of mass, the countermovement, the kinematics of the approaching phase, and the angular amplitudes of the lower limbs. However, no significant differences were found in the maximal angular velocities of the lower and upper limbs or in the amplitudes of the upper limb motion.

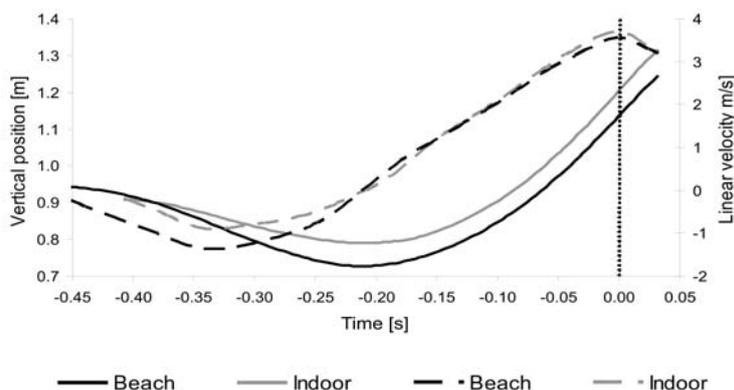


Figure 1 Position (solid) and Velocity (dashed lines) of centre of mass during spike jumps on indoor and beach surface

DISCUSSION: Results revealed significant technique adaptations associated with the changing of the movement surface. Movements on sand were significantly slower and led to lower jumping heights. The switch from eccentric to concentric work of the knee extensors was also significantly slower on sand. Athletes tried to compensate the disadvantageous properties of sand by altering approach techniques and amplifying lower joint amplitudes.

CONCLUSION: The altered kinematics of the movement implies altered demands on the neuromuscular system to reach high performance. This should be taken into account when planning fitness training.

REFERENCES:

Tilp, M., Wagner, H. & Müller, E. (2008) Differences in 3D kinematics between volleyball and beach volleyball spike movements, *Sports Biomechanics*, 7(3), 386-397.