

BIOMECHANICAL ANALYSIS OF THE SPIKE MOTION FOR WORLD-CLASS MALE VOLLEYBALL PLAYERS

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KEY WORDS: volleyball, spike motion, motion analysis, kinematics.

INTRODUCTION: The front spike is the most frequently used technique to obtain a point in volleyball, but there is little specific information on the spike motion for elite players during games. That warrants understanding of the mechanism of this motion and an evidence-based coaching. The purpose of this study was to analyze and compare the spike motions of world-class male volleyball players who participated in the Men's World Championship 2006.

METHOD: Spike motions of the world-class volleyball players were videotaped with two high-speed VTR cameras (250 Hz, 1/2000), which were fixed on the audience seats behind and lateral of the hitter's position during the Men's World Championship 2006, in Japan, for a three-dimensional analysis by a DLT method. Body segment endpoints were manually digitized for a 14-segment model with Frame-Dias II VTR digitizer (DKH Co., Japan). The height and velocity of the right hand, the angles and angular velocities of the upper limb joints and trunk, as well as the whole body CG velocities were calculated from the coordinate data, which were smoothed with a Butterworth digital filter (cut-off 5~12Hz).

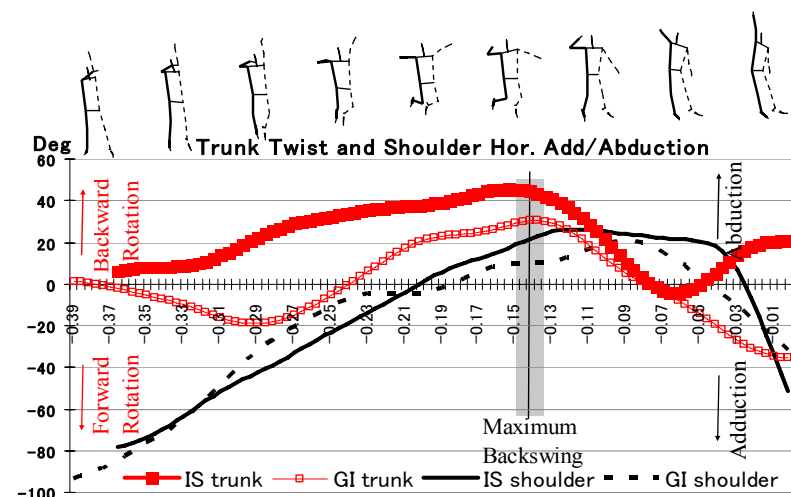


Figure 1 Trunk twist and shoulder horizontal add/abduction
Figure 1 Trunk twist and shoulder horizontal add/abduction (cut-off 5~12Hz).

RESULTS: The player GI (age: 29 yrs; body height: 1.92 m; body mass: 85 kg) from Brazil spiked the ball at higher velocity of the right hand, but at a slightly lower height than player IS (22 yrs; 1.97 m; 100 kg) from Japan. Figure 1 shows the trunk twist and shoulder horizontal adduction/abduction angles from the toe-off to the ball impact. GI continuously rotated the trunk forward until the impact while IS changed from forward to backward trunk rotation a little before it. IS acutely horizontally adducted the shoulder before the impact.

DISCUSSION: The player GI's continuous trunk forward rotation until the impact was smooth and seemed to be skilful. The player IS's interruption of the trunk forward rotation just before the impact may have caused the decrease in the swing velocity of his arm. On the other hand, IS retarded the shoulder horizontal adduction relative to the trunk forward rotation, the so-called "lagging back", which is a characteristic of skilled spikers (Marquez et al., 2005).

REFERENCES:

Marquez, W.Q., Masumura, M., Ae, M. (2005). A biomechanical analysis of spike motion for different skill levels of male volleyball players. *Proceedings of XXI ISB Congress* (pp. 518), Cleveland: ISB.