



Forehand Forces

The increasingly more popular open-stance forehand is no more stressful than the traditional square-stance technique on arm muscles and soft and bone tissue, according to an American research report in the *Journal of Science and Medicine in Sport*, the scientific journal of Sports Medicine Australia (SMA).

The report is contained in a special tennis issue of the Journal to be published shortly by SMA, with the support of Tennis Australia.

It points out that recent changes in the weight, size and stiffness of rackets had begun to change the dominant forehand technique used during tennis play.

“The increased speed of modern tennis may be the reason why more players are using the open-stance forehand – once believed to be poor technique – in place of the square-stance version.”

It had been suggested that, because the open-stance forehand does not fully use the kinetic chain of the lower body, reliance on it can overstress a player’s upper extremity, particularly the lower level competitor with poor technique and conditioning.

The study therefore set out to compare the kinetics of the upper extremity of professional and intermediate-level players using both forehand techniques.

“The data did not support the hypothesis that the open stance forehand technique creates significantly higher upper extremity loading than the square stance technique,” the report says.

“On the contrary, the square stance allowed the subjects to produce larger torques, which resulted in greater loading at the joints.

“This increase in loading was possibly due to a more efficient utilisation of the kinematic chain, possibly greater use of trunk rotation and stretch-shortening cycle (SSC) muscle actions. “

The study found that both techniques produced rigorous stresses on the upper extremity muscles and soft and osseous tissue.

“Regardless of the type of stance, there may be potential for the development of strength imbalances and over-use injuries because of the repetitive use of the forehand in tennis play,” the report said.

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24/1/03

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Abstract

**Kinetics of the Upper Extremity in the Open and Square Stance
Tennis Forehand**

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Seven right-handed teaching professionals and eight intermediate tennis players were filmed using two high-speed cameras (100 Hz) as they performed open and square stance forehand drives. Three-dimensional coordinates (3D) were reconstructed using the DLT method. A three-segment rigid body model of the racket and upper extremity was used to calculate the kinetics of the wrist, elbow, and shoulder joints up to impact. The open stance created lower resultant velocities of the racket at impact (21.2 and 15.8 m/s) than the square stance (22.3 and 16.4 m/s) for professional and intermediate subjects, respectively. The largest components of the resultant joint torques were generated by the shoulder horizontal adductors, followed by elbow varus torques, and shoulder internal rotation torques. Torques were similar across stance and skill level except for significantly ($p < 0.05$) greater peak shoulder internal rotation torques in the square compared to the open stance, greater peak wrist flexion torques in the intermediate compared to the professionals, and greater peak wrist flexion torques in the square stance compared to the open stance. The data did not support the hypothesis that the open stance technique creates greater loading throughout the upper extremity than the square stance technique. Peak upper extremity torques were similar to peak torques reported for baseball pitching and represent loads that could contribute to strength imbalances and overuse injuries.