

The Effects of Shoulder and Knee Angular Velocity on the Performance of a Volleyball Forearm Pass

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ABSTRACT

No consensus exists in the scientific or coaching literature regarding the most appropriate technique for executing a forearm pass in volleyball. Thigpen (1967) advocates an arm-dominated technique while Egstrom advocates a leg-dominated technique. Ridgway and Hamilton (1987) suggest that low skilled players focus on using their arms more while high skilled players should use their legs more. **PURPOSE:** To examine forearm passing techniques of advanced players to identify characteristics of successful passing. **METHODS:** Eleven female collegiate volleyball players (20.5 ± 0.7 yrs, 69.2 ± 9.6 kg, 172.5 ± 7.9 cm), provided informed consent before participating. Standing ~8 m from the net, participants received an attacked ball and attempted to pass it to a target at the center of the court adjacent to the net. The attack shot was simulated by launching a volleyball from a height of ~2.4m at 15m/s from a pressurized device. Each pass was scored on a scale of 0-3 points (3=best) based on where it landed on the court. An average score for all trials was computed. All trials were filmed at 50Hz. Reflective markers placed on the shoulder, wrist, hip, knee, and ankle were autdigitized for the three highest-scoring passes for each participant. Shoulder and knee angular kinematics were computed from the digitized coordinates of the markers. Mean angular velocity for the shoulder and knee was computed across three frames of data beginning two frames prior to ball contact. These velocities were used to describe respective movement of the arms and legs. **RESULTS:** For analysis, participants were divided into two groups (high and low performance) based on passing score. Mean (SD) passing scores for the high performing group (2.32 ± 0.06) were significantly higher than the low performing group (1.80 ± 0.32), ($t(6) = 3.54$, $p = 0.006$). Despite an 80% increase in mean knee angular velocity through contact, the high performing group's leg action (-46.90 ± 24.68 deg/s) was not statistically different than the low performing group's leg action (-9.69 ± 67.39 deg/s). However, shoulder angular velocity through contact was 42% lower ($Z = -2.013$, $p = 0.04$) for the high performing group (100.03 ± 68.20 deg/s) than the low performing group (172.10 ± 43.14 deg/s). **CONCLUSION:** These data suggest that better passers rely on using more leg contribution and less arm contribution when performing a forearm pass.