Reproducibility of a tennis serve protocol

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INTRODUCTION

Serve in modern tennis game is a real offensive weapon for players. In kinematic analysis, it is the most studied stroke of this game because it is the only stroke played in a closed skill. Players have a maximum of control on this stroke. It is unclear whether 3D kinematic tests are reproducible for the same player under identical conditions and if a familiarization session is necessary. In practice, with professional players, who have little time available to perform tests, familiarization sessions are difficult. The aim of our study is to measure the reproducibility of a 3D serve protocol test.

METHODS

Nine tennis players (righties, regional level, 20 ± 2 years) were asked to hit first flat serves in a 1 m² area placed on the "T" zone of deuce diagonal of the tennis court. Two identical tests are performed one week apart. For each test, we selected the three best serves of the 25 trials (with the highest speed and the highest accuracy). Kinetics measurements were performed using a 3D analysis system (Codamotion), a force platform (Kistler) and a radar gun. 28 markers were placed on the players’ bodies to measure kinematics of the movements: ankles, knees, hips, trunk, shoulder, elbow and wrist dominant side. We measured ball speed, leg drive, linear velocity of the racket and joints, joints range of motion and maximum angular velocities at different positions (armed, maximum external rotation and impact) (1).

RESULTS

All analyzed parameters (linear speeds of racket and joints, leg drive force, joint angles and angular velocities) are reproducible with exception of a small part of them. Our study shows that 5,7% (7 of 122 measurements) joint position parameters and 8,3% (4 of 48 measures) angular velocity parameters are not reproducible from a session to another.

DISCUSSION

Various errors sources encountered in 3D analysis can justify the presence of non-reproducible parameters (2-3). However, after this work, we can state that the established protocol provides reproducible results when analyzing the tennis serve.

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