Handheld Tablets are A Viable Tool for Analyzing Frontal Plane Motion in Drop Vertical Jumps


**Context:** Drop vertical jumps (DVJ) are commonly used to evaluate athletes for lower extremity injury risk. While the use of handheld devices to observe and evaluate movement patterns is increasing, little is known about the measurement error of these tools, particularly when used by varying observers in slightly different positions. **Objective:** To determine the reliability and measurement error of frontal plane projection angle (FPPA) on 2 handheld tablets capturing simultaneous DVJ data in slightly different positions and analyzed by a series of randomly assigned investigators. **Design:** Cross-sectional. **Setting:** Laboratory setting. **Patients or Other Participants:** 30 healthy volunteers participated (24 females, 6 males; age:20.0±1.0yrs; height:164.9±13.0cm; mass:69.0±15.4kg).

**Interventions:** Participants performed 3 trials of DVJ from a 31.0cm box. Of the 6 investigators, a rotating schedule allowed for two investigators to be randomly assigned to capture a participant’s trials. These 2 investigators stood side-by-side at 3.7m in front of the participant. The side to which the investigators stood (left or right) was randomly assigned. Each investigator held a tablet at a self-selected chest height, perpendicular to the ground in portrait view orientation. Each DVJ trial was captured simultaneously on 2 tablets. The same 6 investigators were randomly assigned to measure left limb FPPA using a free video analysis tablet application. **Main Outcome Measures:** For each captured video, the frame selected for analysis was at the instant of maximum downward displacement during the landing phase of the DVJ. FPPA was measured as the acute angle created by the intersection of 2 lines: one line from the anterior superior iliac spine to the midpoint between the femoral condyles, and a second line from the midpoint between the tibial and fibular malleoli to the midpoint of the femoral condyles. No investigator analyzed the same trial on both tablets. In total, 180 trials were analyzed; 90 trials were randomly selected for which intraclass correlation coefficients (ICC$_{2,1}$) and standard error of measurement (SEM) were calculated between the two tablets. For the other 90 trials, a paired samples t-test was used to determine the difference in FPPA between the tablets. **Results:** Means±SD are presented for descriptive results. The reliability analysis revealed good agreement between the left (163.5°±9.2) and right (160.1°±9.4) tablets (ICC$_{2,1}$=0.8; SEM=2.4°; p<.001). For the differences analysis, there was no significant difference between FPPA angles for the left (164.8°±9.0) or right (162.9°±9.1) tablets, p=0.1. The difference (1.9°±10.5) between the two tablets did not exceed the SEM. **Conclusions:** Evaluating FPPA during DVJs can be consistently performed by different observers stationed in slightly different positions while maintaining a frontal view using handheld tablets and standard biomechanical measurement applications. These findings provide evidence supporting the use of tablets in clinical and field settings for evaluating FPPA during DVJs for biomechanical profiles related to lower extremity injury. **Word Count:** 450