

Optimal Number of Trials Required to Obtain Reliable Plantar Pressure Measurements Utilizing a Two-Step Approach

Keenan KA, Akins JS, Dugan B, Abt JP, Sell TC, Lephart SM: Neuromuscular Research Laboratory, Department of Sports Medicine and Nutrition, School of Health and Rehabilitation Sciences, University of Pittsburgh, Pittsburgh, PA

Context: Dynamic barefoot plantar pressure measurements have been used widely in the assessment of the diabetic foot and, more recently, in the sports medicine setting to identify risk factors for lower extremity overuse injuries and footwear selection. Currently, there are no recommendations as to the minimum number of trials that should be collected in order to obtain reliable data. **Objective:** To assess the reliability of a pedographic platform and determine the optimal number of trials necessary to obtain reliable plantar pressure measurements utilizing a two-step approach. **Design:** Reliability study. **Setting:** University sports medicine laboratory. **Patients or Other Participants:** Ten physically active males and females (age: 27.7±4.1yrs, mass: 77.6±10.7kg, height: 174.3±7.0cm) participated. Subjects reported no history of lower extremity surgery or injury during the six months prior to testing as well as no gait or balance disturbances. **Interventions:** Dynamic barefoot plantar pressure measures were collected using the Emed-X pedographic platform (Novel, GmbH, Munich, Germany) during two sessions. Using a two-step approach and self-selected pace, 10 trials were collected for the right foot in each session. The foot was divided into 9 anatomical regions: medial hindfoot (MHF), lateral hindfoot (LHF), midfoot (MF), each metatarsal (MT1- 5), and the great toe (GT). Average mean pressure (AMP), force-time integral (FTI), peak pressure (PP), and pressure-time integral (PTI) were calculated for each region. Intraclass correlation coefficients (ICC) were calculated using a two-way random effects model (ICC [2, k]) for 10, 8, 5, and 3 trials. **Main Outcome Measures:** ICC values from two-way random effects model. **Results:** Across all number of trials, ICCs ranged from 0.80- 0.99 (SEM: 1.25-9.60kPa) for AMP, 0.78- 0.97 (SEM: 1.27- 7.82N*s) for FTI, 0.70- 0.97 (SEM: 9.80- 96.93kPa) for PP, and 0.62- 0.96 (SEM: 4.36- 36.14kPa*s) for PTI. Across all regions and for all variables, 5 trials demonstrated the best consistency (ICC, SEM)- AMP: 0.851- 0.99, 1.25- 6.27kPa; FTI: 0.86- 0.97, 1.27- 4.2N*s; PP: 0.83- 0.97, 9.80- 35.85kPa; PTI: 0.80- 0.95, 4.36- 12.01kPa*s. LHF, MT1, MT2, and GT were found to be the most reliable as indicated by ICCs ≥ 0.80 across all trials and all variables. **Conclusions:** Reliable measurements of AMP, FTI, PP, and PTI can be obtained using the pedographic platform and a two-step approach. In order to obtain maximum reliability of the measures, 5 trials should be collected. This information should be used to guide dynamic plantar pressure assessments in both research and clinical settings. **Word Count:** 397