

The CAD WALK Hallux Valgus Dataset (Pre-Surgery)

This dataset contains the raw dynamic plantar pressure measurements of 50 Dutch individuals with Hallux Valgus collected prior to surgical intervention at Sint Maartenskliniek centres in the Netherlands. The collection of this dataset was approved by the internal review committee of the Sint Maartenskliniek and met the requirements for exemption from the Medical Ethics Committee review under the Dutch Medical Research Involving Human Subjects. All participants also gave their written informed consent to allow their anonymized data to be included in this dataset. In total, 54 individuals were measured, but 4 were excluded from this dataset due to other gait-related impairments (e.g. diabetes, parkinson's disease).

For each individual (named HV01 to HV54), the following measurements were collected:

- Demographic Factors: The age, sex, weight, height, shoe size (on the EU scale), handedness, and leg dominance information of each individual is recorded in the file *metadata.xlsx*.
- Plantar Pressure Measurements: For each individual, between 8-15 dynamic plantar pressure measurements ("trials") are provided for both feet. Out of the 50 individuals in this dataset, 15 trials were collected from 46 of them. The exceptions are HV07 (8 trials), HV44 (11 trials), HV45 (11 trials), and HV46 (13 trials).

These measurements are provided in the NiFTi file format with the file names *left_foot_trial_###.nii* and *right_foot_trial_###.nii*. The NiFTi file format was chosen for these measurements because it is a non-proprietary medical imaging format that is well-supported by various software packages (see http://www0.cs.ucl.ac.uk/opensource_mia_ws_2012/links.html for a short list).

- Walking Speed Information: For each plantar pressure measurement of each individual, the walking speed, stride length, and stride time, have also been recorded. This information is group per individual and can be found in the files *walking_speeds_HV###.xlsx*.
- Foot Self-Assessment Scores: Each individual also provided self-assessments of their foot function using the questionnaires described below. These self-assessment scores for all individuals are recorded in the file *assessment_scores.xlsx*.
- Radiographic Measurements: Each individual also had their hallux valgus angle and intermetatarsal angle measured from x-ray images. These angles, along with information on whether the joint exhibits arthrosis, are recorded in *radiographic_measurements.xlsx*.

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If you use this dataset in a publication, we ask that you cite it appropriately as follows:

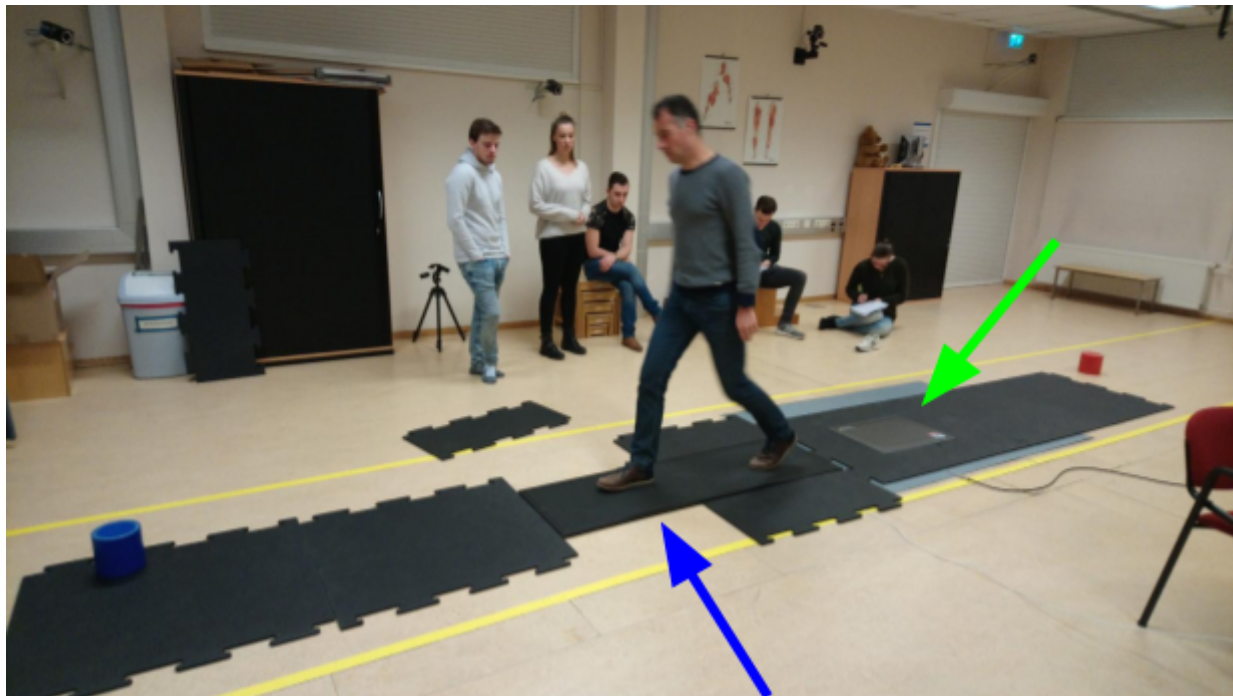
Brian G. Booth, Noël L.W. Keijsers, Toon Huysmans, and Jan Sijbers. "The CAD WALK Hallux Valgus Pre-Surgery Dataset", March 2019, Zenodo, <http://dx.doi.org/10.5281/zenodo.2598496>.

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Data Collection Protocol

The plantar pressure measurements were collected using a 0.5 m footscan® plate (rs scan, Paal, Belgium; dimensions: 48.8 × 32.5 cm) on top of a Kistler force plate (9286AA, Kistler, Wintherthur, Switzerland), which were synchronized with a rs scan footscan® 3D interface box. The pressure data was gathered in rs scan's footscan® software 7 gait 2nd generation, from which it was exported and then converted to nifti format using MATLAB version 2016b (The MathWorks, Natuck, USA). The footscan® pressure plate used for data collection has non-square sensor dimensions (7.62 mm × 5.08 mm), resulting in each footstep looking compressed in the anterior-posterior direction. No geometric correction for this non-square sensor effect has been applied. Data was measured at a frequency of 200 Hz.

Additional plantar pressure measurements were collected in conjunction with those described in the paragraph above. A 1.5 m rs scan footscan® plate (rs scan, Paal, Belgium; dimensions: 146.3 × 32.5 cm) was placed after the 0.5 m plate in order to collect two subsequent footsteps from the participant being measured (see figure below). The pressure data was collected in rs scan's footscan® software 9.5.1 and this software was used to compute the distance and time between the subsequent footsteps. These two quantities were then used by the software to estimate the walking speed. It is these stride distance, stride time, and walking speed measurements that we report for each corresponding plantar pressure measurement with the 0.5 m plate.



Plantar pressure and walking speed data was collected using two rs scan pressure sensing plates operating in tandem : a 0.5 m plate (green arrow) was used to record the pressure measurement while a 1.5 m plate (blue arrow) was used to collect two footsteps. The distance and time between these two footsteps is then used to estimate the walking speed.

Data was collected using the 3-step protocol of Bus and de Lange (<https://doi.org/10.1016/j.clinbiomech.2005.05.004>). The participant's start location is marked by a red marker (see figure above) to ensure that their third step lands on the 0.5 m plate and that their 5th and 6th steps land on the 1.5 m plate. Rubberized mats were used to ensure that the pressure plates were level with the participant's walking surface (see figure above).

With respect to demographic factors, each participant's age, sex, and shoe size were self-reported. Their height and weight were measured using a drop-down tape measure and an electronic scale respectively. Each participant's handedness and leg dominance was assessed using the Waterloo handedness and footedness questionnaires ([https://doi.org/10.1016/S0028-3932\(97\)00107-3](https://doi.org/10.1016/S0028-3932(97)00107-3)).

Additionally, each hallux valgus case was imaged using x-ray and measurements of the hallux valgus angle, and intermetatarsal angle, were recorded as described in the literature (<http://www.jfootankleres.com/content/2/1/15>). The presence or absence of arthrosis in the joint was also assessed by a trained orthopaedic surgeon.

Finally, participants were asked to assess their foot function using two questionnaires: the 5pt foot function index (<https://www.ncbi.nlm.nih.gov/pubmed/12022318>), and the Manchester-Oxford foot questionnaire (<https://dx.doi.org/10.1302%2F2046-3758.24.2000147>). Both questionnaires provide scores as a percentage, with larger scores indicating a greater severity of the Hallux Valgus.