
**MULTICENTER OSTEOARTHRITIS STUDY**

# READING CENTER DATASET DESCRIPTION
# V3PLANTARPRESSURE & V3PPPHOTO_VIDEO

**MAY 2022**

TABLE OF CONTENTS

## 1. Dataset description and Analyst Notes

Dataset: V3PLANTARPRESSURE.sas7bdat
Observations: 20513 records (2054 participants, 2 sides: Left & Right, 1 to 5 trials per side)
Documentation:

- VariableGuide_V3PLANTARPRESSURE.pdf
- Distributions_V3PLANTARPRESSURE.pdf
- Operation Manual chapter: 3R_PlantarPressure_v1.0pSept2021.pdf

Dataset: V3PPPHOTO_VIDEO.sas7bdat
Observations: 1372 records (1372 participants, 1 record per participant)
Documentation:

- VariableGuide_V3PPPHOTO_VIDEO.pdf
- Distributions_V3PPPHOTO_VIDEO.pdf

V3PLANTARPRESSURE dataset contains 20513 records; 1 to 10 record per participant parameters based on Plantar Pressure data collected during 60m clinic visit for all eligible participants who did not meet exam exclusion criteria. Reading center (Dr. H Hillstrom) processed all data.

Note: During plantar pressure exam, there was additional data collected such as sitting photo, standing photo and video files. These were reading projects completed in addition to the main exam data with parameters produced based on standing or sitting photo or video. These additional readings were performed in the BU gait lab (Dr. D Gross).

**Dataset structure V3PLANTARPRESSURE:**

- Variables #1 to #6 from the MOST tracking forms.

- Variables #7 to #72 – reading parameters based on the Plantar Pressure digital file processed by reading center (Dr. H Hillstrom).

**Dataset structure V3PPPHOTO_VIDEO:**

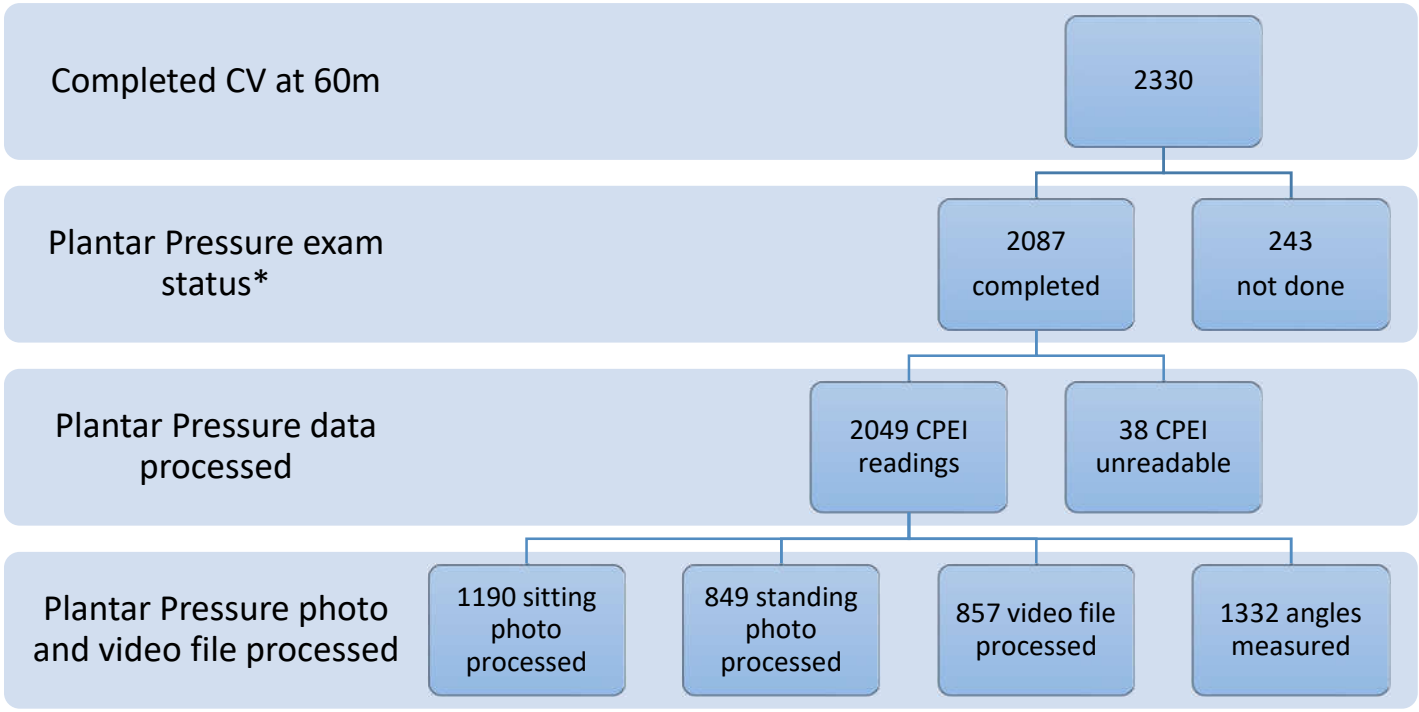
- Variables #1 to #10 from the MOST tracking forms and includes indicator variables for various data included. Note: based on the quality of data collected and various other reasons (such as selection, availability, image quality, etc.) some parameters are processed on two sides (Left and Right) and some are processed only unilaterally.

  Coordinating Center recommends exploring data for possible outliers and adjust for ReaderID in addition to other demographic characteristics.

- Variables #11 to #20 – reading parameters based on the Plantar Pressure photo files processed by reading center (Dr. D Gross).

- Variables #21 to #28 – reading parameters based on the Plantar Pressure video files processed by reading center (Dr. D Gross).

## 2. FLOW CHART – Plantar Pressure exam completion and reading status




*Summary report: reason exam was not completed, exclusion criteria:

| | N participants | % |
|---|---|---|
| **Plantar Pressure exam not done** | **243** | **100%** |
| exclusion criteria met (Open wound on the bottom of either foot) | 10 | 4.1% |
| exclusion criteria not met - participant refused to complete exam | 3 | 1.2% |
| exclusion criteria not collected – reason not provided** | 230 | 94.7% |

**participants may decline exam or clinic may decide not to perform exam due to safety concern.

In addition, if participant did not complete the Gait Rite exam or 20-meter walk, participant was not asked to participate in plantar pressure exam based on the protocol.

## 3. References

**1.** Rao S, Song J, Kraszewski A, Backus S, Ellis SJ, Deland JT, Hillstrom HJ. The Effect of Foot Structure on 1st Metatarsophalangeal Joint Flexibility and Hallucial Loading. Gait Posture. 2011 May;34(1):131-7. Epub 2011 May 1., PMID: 21536440

2. Hillstrom, HJ, Song, J, Kraszewski AP, Hafer, JF, Mootanah, R, Dufour, AB, Chow, S, Deland, JT. Foot Type Biomechanics Part 1: Structure and Function of the Asymptomatic Foot. Gait Posture. 2012 Oct 26. [Epub ahead of print], PMID: 23107625

3. Mootanah, R, Song, J, Lenhoff, M, Hafer, JF, Backus, SI, Gagnon, D, Deland, JT, Hillstrom, HJ, Foot Type Biomechanics Part 2: Are Structure and Anthropometrics Related to Function? Gait Posture. 2012 Oct 26. [Epub ahead of print], PMID: 23107624

Related Literature

4. Segal NA, Boyer ER, Teran-Yengle P, Glass NA, Hillstrom HJ, Yack HJ. Pregnancy Leads to Lasting Changes in Foot Structure. Am J Phys Med Rehabil. 2012 Oct 31. [Epub ahead of print], PMID: 23117270

5. Jinsup Song, Rupali Joshi, Rajshree Mootanah, Smita Rao, Andrew P. Kraszewski, Sherry I Backus, Howard J. Hillstrom, Plantar Pressure Assessment of the Athlete, *Foot and Ankle Sports Medicine*, Editors: D. Altchek, J. Dines, R. Positano, Wolterskluwer, 2012.

6. Rupali Joshi, Jinsup Song, Rajshree Mootanah, Smita Rao, Sherry I Backus, Howard J. Hillstrom, Foot Structure and, Function, *Foot and Ankle Sports* Medicine, Editors: D. Altchek, J. Dines, R. Positano, Wolterskluwer, 2012.

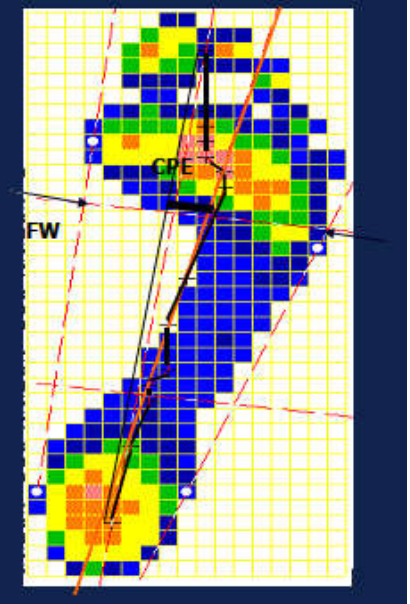
4. **Reading project 1: Plantar Pressure parameters**

## Protocol

*#1 reason for CPEI failure – drop foot*
*#2 reason for CPEI failure – lack of heel toe gait*

- Center of Pressure Excursion Index (CPEI), the concavity of the COP curve, was calculated for each subject and trial.
- To calculate a valid CPEI measure the plantar pressure distribution must;
  - (1) not encroach upon a border of the sensors,
  - (2) be obtained from data corresponding to a heel-toe gait pattern,
  - (3) not involve a skuff or a trip,
  - (4) not have stray pressure data that is non-contiguous with the footprint, and
  - (5) be obtained from an emed-X system that has had a calibration within one year of the date of data collection.

  * N=193 trials unscorable (99 UAB, 94 UI)

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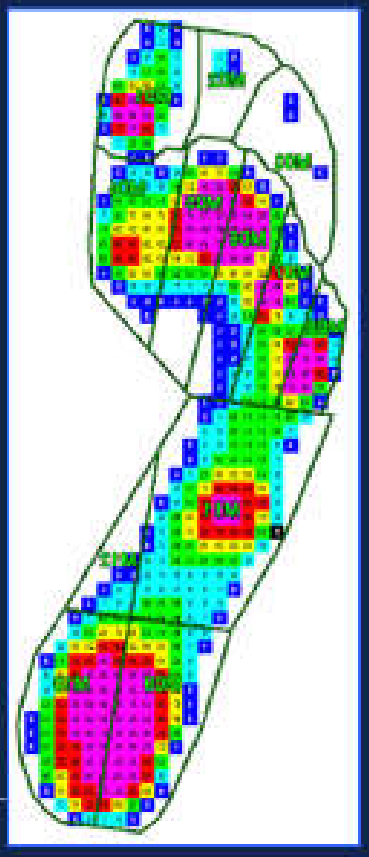
CPEI=(CPE/FW)x100

# Protocol

- Several additional parameters were calculated for each masked region of the plantar pressure distribution.
  - Peak plantar pressure (PP, *N/cm²*)
  - Maximum Force (MF, *N*)
  - Pressure-Time Integral (PTI, *N-s/cm²*)
  - Force-Time Integral (FTI, *N-s*)
  - Area (*cm²*)
- **Valid** CPEI and masked plantar pressure parameters have been concatenated with other MOST parameters to examine how foot structure and function may be related to knee OA.



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# Plantar Pressure Validity

1. The Accuracy of an Automasking Algorithm in Plantar Pressure Measurements, Scott J. Ellis, MD; Hill Stoecklein, BS; Joseph C. Yu, BS; Grisha Syrkin, BS; Howard Hillstrom, PhD and Jonathan T. Deland, MD, HSS Journal Volume 7, Number 1, February 2011.

2. Accuracy of the Novel Emed X and TekScan MatScan, Hillstrom, HJ, Lenhoff, M, Hannah, M, Gross, D, Hafer, J, et al, in review, Gait & Posture.

   In comparison with the gold standard factory calibrator over the range of 0-850 kPa at baseline, 1 week, and 1 month follow-up, error in Emed-x measurements never rose above 2% RMS.

3. Reliability and Stability of Parameters from the Novel Emed X and TekScan MatScan plantar pressure measurement , Hafer, Hillstrom, HJ, Lenhoff, M, Hannah, et al, in revision, Gait & Posture.

   ICC (2,1) >0.9 for every plantar pressure parameter; parameter stability (<10% difference with unbiased estimate of mean) resulted from averaging 4 trials of each parameter – we're averaging 5 trials

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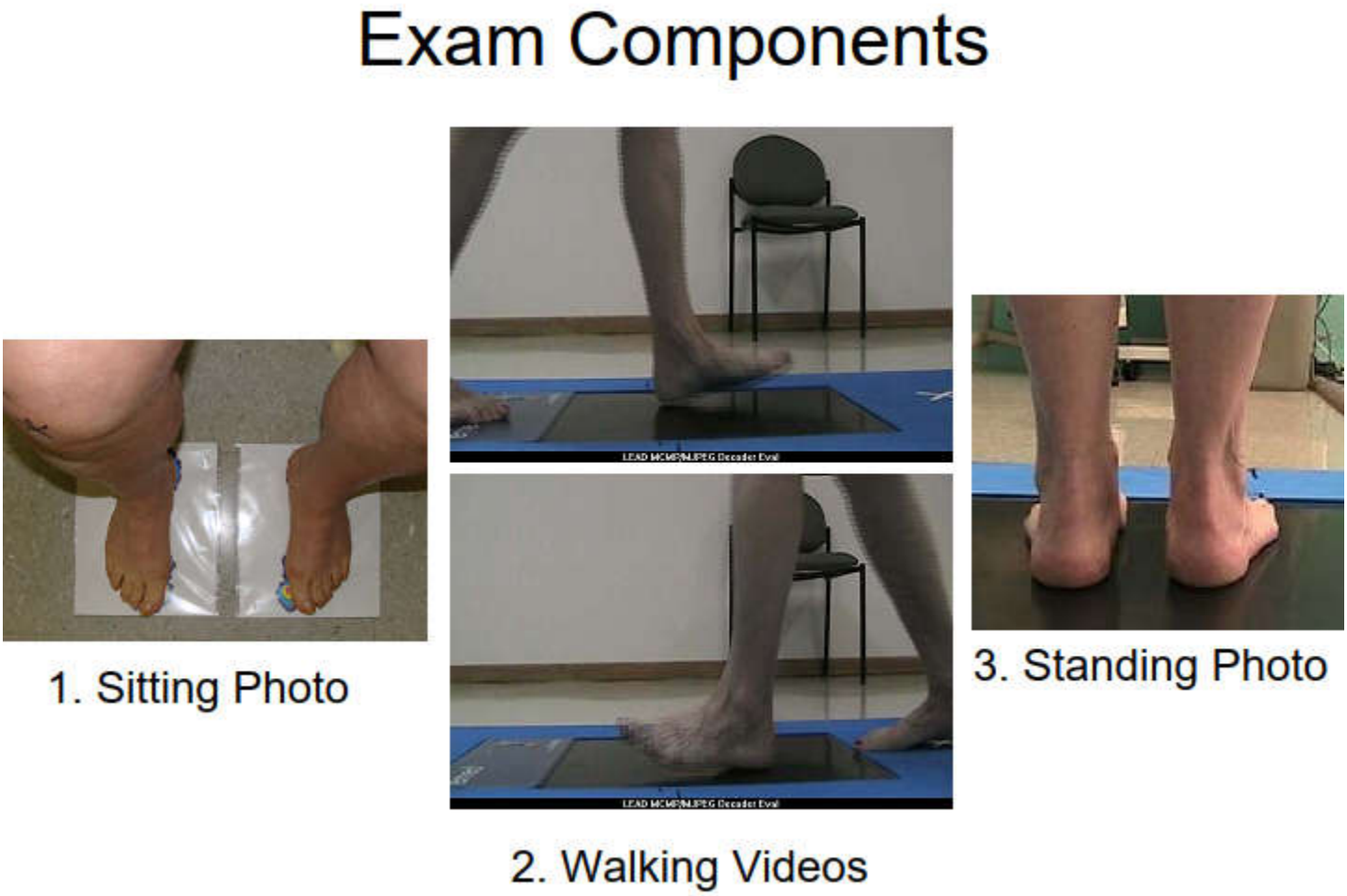
5. **Reading project 2: Photo and Video parameter readings**



# Measured Variables


1st MTP Alignment
(Sitting Photo)


Resting Calcaneal
Stance Position
(RCSP)
(Standing Photo)


1st MTP Peak Extension
(Walking Videos – Medial View)