

Description of the GaitPhase Database

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14.10.2014

OBJECTIVE The objective of this study was to evaluate the percentage duration of the gait sub phases *stance*, *loading response*, *mid stance*, *terminal stance*, *pre swing* and *swing* as dependency on walking speed using an infrared cinematography system and an instrumented split-belt treadmill. Thus, a reference data set based on a large amount of steps under well controlled conditions is presented.

ACTIVITIES The performed exercise was walking on a split-belt treadmill at 12 different walking speeds in the interval [0.6, 1.7] m/s at 0.1 m/s increments for one minute at each speed. The speed order was unknown to the subjects and randomized, with a tendency to higher speeds at the sessions end to minimize fatigue effects.

STUDY DESIGN 21 healthy heel-striking subjects (10 male, 11 female, age: 23.8 yrs \pm 3.3 yrs, height: 172.8 cm \pm 9.4 cm, weight: 66.6 kg \pm 10.9 kg; all values are mean \pm standard deviation) without injuries or diseases affecting the musculoskeletal system participated in this study. All subjects gave written informed consent. Subject 4 was excluded from the analysis, as not the whole protocol was completed.

SYSTEM SETUP The 3D marker positions were sampled at a rate of 200 Hz. The 3D ground reaction forces of each foot were sampled at 1000 Hz. Figure 1 shows the lab setup.

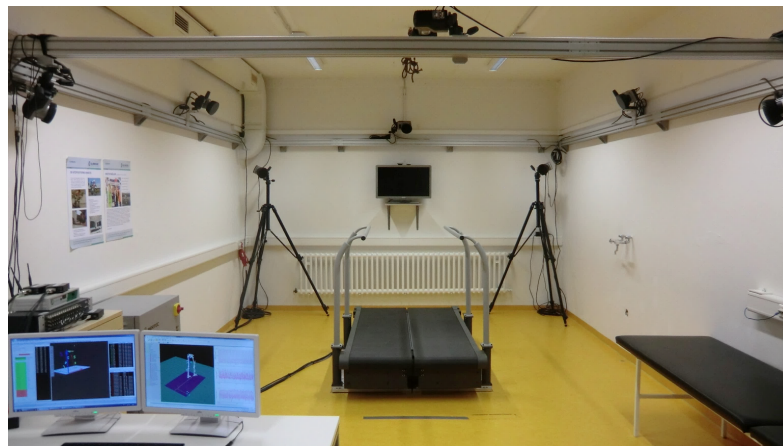


Figure 1: **Laboratory setup.**

The data set includes the ground reaction forces as well as the marker positions of the markers that were placed on the shoes above the first (FM1), second (FM2) and fifth metatarsal (FM5) heads and on the aspect of the Achilles tendon insertion on the calcaneus (FCC) for dynamic tracking (figure 2).

FILE FORMAT All data is stored in comma separated files for each subject and speed separately. Due to the different sampling rates, marker and force data are separated as well. The preprocessing consisted of force drift correction and low pass filtering of force and



Figure 2: **Reflective markers.** Red circles indicate the dynamic markers used for tracking.

marker data with a cutoff frequency of 6 Hz. The events of the manually marked oversteps are contained in an separate comma separated file.

The file naming is as follows: **[Subject]_[Speed]_[force/marker/oversteps].csv**

The laboratory coordinate system coincided with the following anatomical directions:

x: posterior-anterior direction
y: right-left direction
z: inferior superior (vertical) direction

Marker positions

The markers are named according to the foot side, anatomical position and the direction: **[L/R]_[Position]_[x/y/z]** and occur as columns in the following order:

L_FCC_x, L_FM1_x, L_FM2_x, L_FM5_x, R_FCC_x, R_FM1_x, R_FM2_x, R_FM5_x,
L_FCC_y, L_FM1_y, L_FM2_y, L_FM5_y, R_FCC_y, R_FM1_y, R_FM2_y, R_FM5_y,
L_FCC_z, L_FM1_z, L_FM2_z, L_FM5_z, R_FCC_z, R_FM1_z, R_FM2_z, R_FM5_z

Ground reaction forces

Force plate 1 (FP1) corresponds to the left foot, force plate 2 (FP2) to the right foot. The ordering of the columns is as follows:

FP1_x, FP2_x, FP1_y, FP2_y, FP1_z, FP2_z

Overstep events

Each entry in the file marks the time point (in seconds) where a manual overstep events was set.