

**Kinematic and Kinetic Gait Analysis for MBT Mwalk, MBT Dualboard and a Control Shoe
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MBT Model: Mwalk, Dualbord

ABSTRACT

The two main aims of this study were

- a) to determine if the new MBT Dualboard produces similar gait characteristics as the classical MBT shoe (MWalk), and
- b) to identify differences in the gait characteristics between MBT shoes and normal control shoes.

Twelve subjects volunteered for this study. All subjects had been using MBT for a minimum of 3 months. Gait characteristics were recorded for 5 walking trials per test shoe at a walking speed of 1.5 ± 0.15 m/s. The order in which the shoes were tested was randomized for each test group (male, female).

Kinematic data were collected using a high-speed video system using 8 cameras at a sampling rate of 240 Hz. Kinetic data were collected simultaneously with the kinematic data using a force platform. Linear and angular position, velocity and acceleration data were calculated and exported for further analysis.

Differences between gait characteristics when walking in the different test shoes were analyzed by determining the sole angle, the stride length, the trunk angle, the joint angles in the lower extremity, the ground reaction force, and the joint moments in the lower extremity.

In all important features of the gait that are typical for MBT shoes the new Dualboard showed the same characteristics as the MBT MWalk model. Some differences in angle and moment waveforms of the ankle abduction/adduction and ankle inversion/eversion movements were found. However, due to large trial-to-trial and subject-to-subject variability as well as the small magnitude of these variables the discrepancies were considered irrelevant.

When walking in MBT shoes compared to walking in normal shoes two distinct differences can be noticed immediately: a) The first contact point between shoe and ground is closer to the center of the ankle joint complex due to the rounded sole under the heel of the shoe. In normal shoes the first contact is on the posterior section of the heel. b) The rounded sole allows the foot to roll over a pivot point created by the “MBT sensor” and the rounded sole, whereas in normal shoes the sole stays flat on the ground for approximately 50% to 60% of the stance phase.

These differences in the ground contact produce characteristic differences in the kinematics and kinetics of the whole body:

- Ankle and knee angles showed differences in the waveform characteristics. The most pronounced differences can be found in the ankle dorsiflexion and in the knee flexion angles.
- The upper part of the body was found to be more upright.
- The ground reaction forces during early stance phase increase more rapidly indicating that the foot is faster loaded than when wearing normal shoes.
- The characteristics of the waveforms of ankle and knee moments were different, however, these differences were not substantial enough to be of clinical relevance.

All differences between MBT and normal shoes were consistent between both MBT shoe types.