Changes in gait characteristics of a normal healthy population due to an unstable shoe construction.

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Internal Report.

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August 2004

Publication: unpublished.

MBT Model: sole 2004

ABSTRACT

INTRODUCTION: Back pain is the third most common bodily symptom after headache and tiredness with 60-80 % of people suffering low back pain at some time in their lives (Croft et al.). Osteoarthritis is another common cause of pain and disability in older adults (Peterson IF, Feldson DT).

The average UK citizien walks in the region of 183 miles (305 km) per year on the pubic highway or other unrestricted areas which are paved or tarred and over 50 yards.

This equates to a huge number of footfalls every year, each of which results in a loading effect of the structures that comprise these joints will have a significant affect on the accumulation of microdamage.

Anecdotal evidence has suggested that the frequent use of an unstable shoe construction can help in rehabilitation and even prevention of many of these complaints.

If the MBT shoe can be shown to reduce loading through the hip, knee and ankle as suggested by a preliminary study from The Human Performance Laboratory University of Calgary (Nigg B et al.) the potential beneficial impact the shoe could have as a tool for treating osteoarthritic hip and knee is significant.

If the MBT shoe can be demonstrated to alter loading or posture of the lumbosacral spine its application as a tool in the treatment of back pain will be significant.

METHODS:

- Twenty two participants (11 male, 11 female); Age 30 – 35 take partPhysically active and free from musculoskeletal injury at the time of testing.Eight-camera digital motion capture system (Motion Analysis Corporation, Santa Rosa, CA, USA) sampling at 200 Hz. Kistler Type 9281CA force platform (Kistler Instrumente AG Winterthur, Switzerland) sampling at 1000Hz.
- Each participant underwent a tutorial session (10 minutes)
- Tested in the lab under normal conditions and then in the MBT condition.
- Helen Hayes marker set incorporating a static calibration trial.
- Data analysed using OrthoTrak software (MAC) and custom MATLAB software (SHU).
- Series of three-factor (condition, foot, gender) ANOVA, with repeated measures on the factors condition and foot.
- Alpha level of significance was set at the 0.05 level for all statistics.

RESULTS: Many of the kinematic variables remained unchanged, there were significant differences in both the trunk and the ankle angles. MBT shoes promote less forward lean during locomotion suggesting a more upright posture. Although not confirmed by the present study, the probable effect is a shift in the centre of mass position closer to the centre of the base of support, possibly aligning the body more optimally for locomotion. This, in conjunction with the lower hip moments experienced in the MBT condition may suggest reduced loading of the lower back.

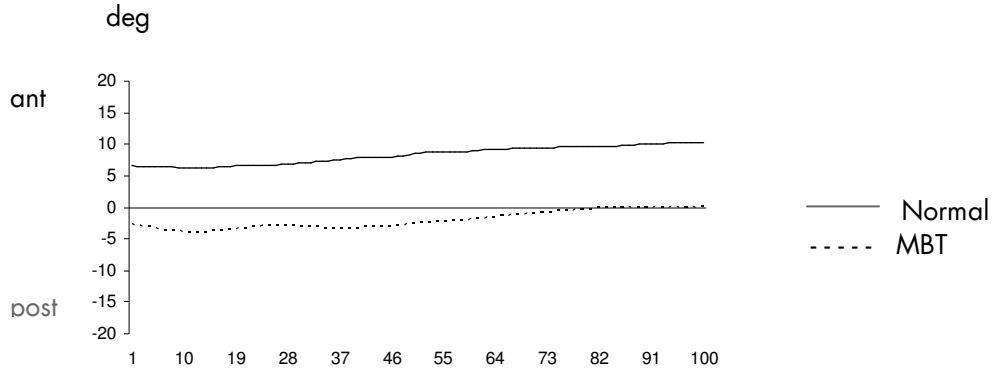

Figure 1: Trunk angle during the stance phase of gait for the MBT and normal condition.

The changes in the ankle plantar flexion/ dorsiflexion angle at the ankle, was primarily due to the reduced plantar flexion following initial contact during the MBT condition when compared to the normal condition.

Kinetics at each of the joints of the lower limb were different between the MBT and normal conditions. The lower moments experienced at these joints suggests a resultant decrease in joint loading.

The major finding from analysis of the ground reaction force data is the suggestion that there is a higher incidence of transient peaks when wearing normal shoes compared to MBTs. There is some evidence suggesting that transient forces transmitted through the skeleton are the primary aetiological factor in the development of many musculoskeletal disorders. These include, osteoarthritis, stress fractures, plantar fascilitis and Achilles tendonitis and low back pain (Whittle, 1999).

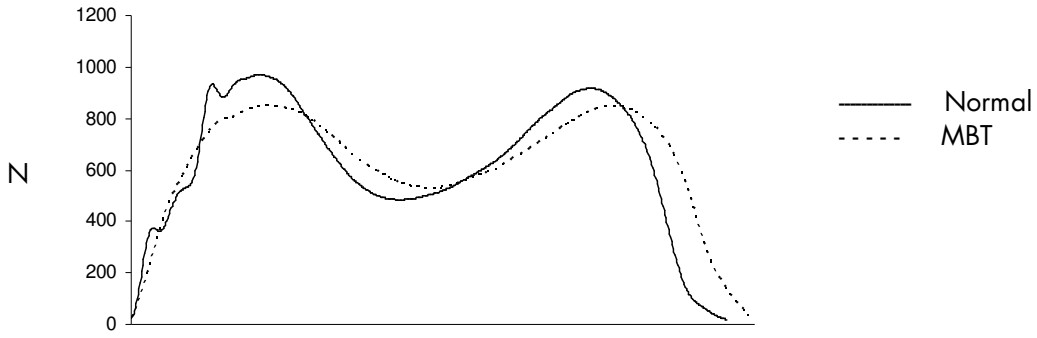

Figure 2: Vertical ground reaction force trace during the stance phase of gait for the MBT and normal condition.

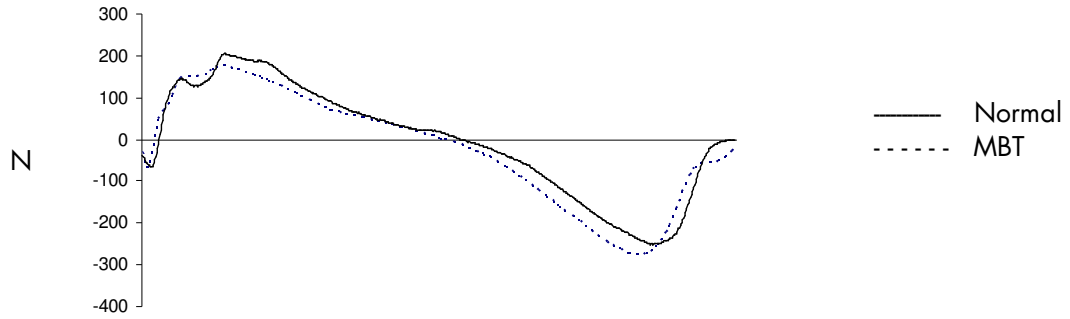

Figure 3: Anterior - posterior ground reaction force trace during the stance phase of gait for the MBT and normal condition.

CONCLUSION: This initial study into the effects of an unstable shoe construction suggests that MBTs alter certain gait characteristics and that with frequent use they may reduce the incidence of some musculoskeletal problems. In those already suffering from such disorders, MBTs may allow patients to remain mobile by reducing cyclic loading of the already damaged joint.