

# COMPARISON OF VERTICAL FORCES BETWEEN A PRESSURE MEASUREMENT SYSTEM AND A FORCE PLATE

Nicholas Brisson and Marshall Kendall

School of Human Kinetics, University of Ottawa, Ottawa, Canada

**KEY WORDS:** vertical force, gait, pressure mapping, force plate.

**INTRODUCTION:** Force plates and pressure measurement systems are commonly used for clinical and experimental applications. The MatScan (Tekscan Inc.), a lightweight, portable and cost-efficient pressure mapping system, can serve as an alternative to a force plate for measuring vertical forces. There has been much debate, however, as to the accuracy and precision of pressure mapping systems when compared to force plates, which have been considered the gold standard in force measurement (Hsiao, Guan & Weatherly, 2002). Although much research has been conducted using different force and pressure measurement systems, there is virtually no literature that discusses the comparisons of measured forces between these types of systems. The goal of this study was to compare the vertical forces measured by the MatScan to those measured by an AMTI force plate.

**METHODS:** Three participants were recruited for this study. Each participant executed a total of 10 walking trials at a natural, self-selected pace (5 trials with left foot and 5 trials with right foot landing on the MatScan/force plate). The AMTI force plate (OR6-6-2000) was zeroed with the MatScan fixated on top of it. The MatScan was calibrated to subjects' weight (standing two feet on the mat). For each trial, the MatScan and force plate recorded data simultaneously. All trials were averaged and normalized to 100% of the stance phase.

**RESULTS:** Mean vertical forces (N) measured by the AMTI force plate and the MatScan during the stance phase for subject 1 (left foot on the MatScan/force plate) are shown in Figure 1. The absolute mean force difference (%) between the gait patterns obtained from the MatScan and the force plate was 12.7%.

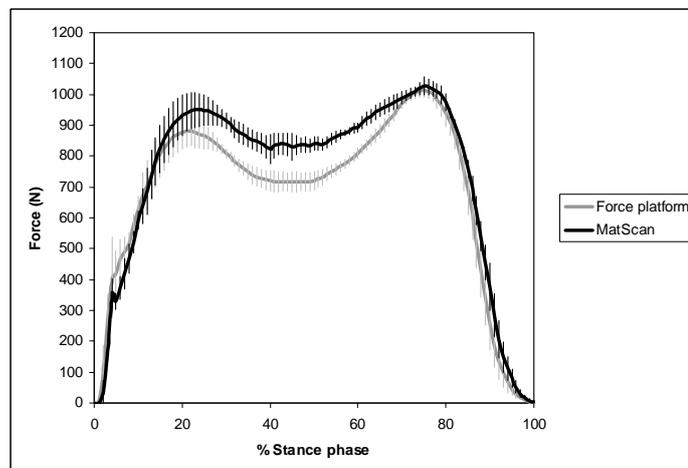
## DISCUSSION & CONCLUSION:

The MatScan significantly over-estimated vertical forces during natural walking when compared to the AMTI force plate. Hence, the MatScan and the AMTI force plate do not produce similar force values in dynamic conditions. The difference between the forces

measured by the two systems may be due to the calibration procedure utilized. Furthermore, the MatScan's encasing may have absorbed some of the force, thereby reducing the amount of force applied to the force plate. More research should be conducted on the MatScan's ability to accurately and precisely measure vertical forces.

## REFERENCES:

Hsiao, H., Guan, J. & Weatherly, M. (2002). Accuracy and precision of two in-shoe pressure measurement systems, *Ergonomics*, 45, 537-555.



**Figure 1** Mean vertical forces (N) measured by the AMTI force plate and the MatScan during the stance phase for subject 1, walking at a natural speed with left foot on the MatScan/force plate.