



Short communication

Plantar pressure measurements using an in-shoe system and a pressure platform: A comparison

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ABSTRACT

This study compared three different foot-pressure measurement methods to investigate whether these measurement methods could or should be used interchangeably. In-shoe pressure measurements using F-Scan system, shod and unshod pressure measurements using the MatScan system were taken for each of the 21 healthy subjects while performing walking trials using a two-step gait initiation protocol. Each foot was separated in three regions: forefoot (40%), midfoot (30%) and rearfoot (30%) for further analysis. The parameters researched include average peak pressure, average peak force, timing and centre of pressure displacement. The in-shoe condition produced the highest values for the average peak force. However, the shod condition showed a trend for the highest average peak pressure. The F-Scan system consistently demonstrated slower timing values for all parameters, except one. Centre of pressure anterior/posterior trajectory was considerably shorter for the in-shoe gait condition. Consequently, the data cannot be extrapolated from one collection method to another. It is therefore recommended that a standardised collection method is utilised when pressure analysis is undertaken and that they are not used interchangeably.

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1. Introduction

Pressure assessment systems are commonly employed in scientific and clinical settings, providing data that will optimise patient assessments and evaluate the treatment outcomes [1,2]. Despite the fact that a large amount of research has focused on foot dynamics [3–5] and pressure analysis in human gait [6–9], the method by which the data are collected does not appear to be standardised, and can vary from one investigation to another. Pressure measurement systems are commonly found in two different formats: an in-shoe based or a platform based assessment system. Even if the systems have inherent characteristic differences due to the nature of their design, these systems are used interchangeably by clinicians to measure foot parameters. As it appears no direct comparison study between systems has been done, the question remains what are the measurement differences between these systems. The aim of this study was to compare various gait parameters such as timing, centre of pressure displacement, average peak pressure and force, measured by an

in-shoe and a platform system, and between the in-shoe, unshod and shod conditions.

2. Methods

2.1. Subjects

A total of 21 healthy subjects (9 males and 12 females) with an average age of 49.52 (± 5.38) years, weight of 82.02 (± 7.79) kg and a height of 169.94 (± 4.84) cm, were recruited for this study.

2.2. Pressure measurement systems

The F-Scan in-shoe system (Tekscan, USA) and the MatScan (Tekscan, USA) were used for the in-shoe and platform based measurements, respectively in order to allow for a proper comparison as the two systems use the same technology. While the F-Scan uses disposable sensors and a spatial resolution of 3.9 sensels/cm², the MatScan a spatial resolution of 1.4 sensels/cm². Both systems were calibrated for each subject, according to manufacturer's guidelines.

2.3. Data collection

A 10-m walkway was utilised and with the MatScan located in the middle of this walkway. A two-step gait initiation protocol [10] was used and all subjects performed a practice trial before collection began. All subjects walked at their own normal speed. The in-shoe and shod data were collected simultaneously. The unshod data was collected separately due to the nature of the condition. Three sets of good data (without losing any frames) were collected per condition, for each foot and each subject. The sampling frequency for both systems was 40 Hz.

2.4. Data processing and analysis

Each foot was separated in three regions: forefoot (FF), midfoot (MF) and rearfoot (RF), 40%, 30% and 30% of the total foot length, respectively. This was achieved by

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