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# Quantification of the compensation of differences in limb length using heel raises

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**Abstract**

*Background:* The compensation of limb length discrepancy achieved using heel lifts is quantified.
*Objective:* To determine the increase in effective length of the lower limbs depending on the height of heel lift used.
*Method:* Five anatomical landmarks in 36 subjects are measured to quantify the increase in level, taking as reference the support surface of the pedoscope, when heel lifts of 6, 12, and 18 mm are used. The results of these measurements are compared to calculate the real increase in height achieved for lifts of known thickness.
*Results:* The use of heel lifts increases the height of the extremity by 76.4% of the maximum height of the lift measured at the posterior edge of the heel.
*Conclusion:* Real compensation value must be considerated using heel lifts in the treatment of limb length discrepancy.


*Keywords:* Heel lift; Limb length discrepancy; Real compensation

## 1. Introduction

In the clinical treatment of limb length discrepancy of the lower limb, orthotic treatment using full insoles or a heel raise is, in most cases, the main means of intervention [1,2].

When clinical examination detects a difference of length in the two lower limbs, the decision to control it totally or partially depends on the clinical experience of the therapist, the symptomatology shown by the patient, and the extent of the limb length difference. No description has been found in the literature of a standard protocol indicating the height of raise to be used for different values of limb length discrepancy [2].

The orthotic compensation of limb length discrepancy can be carried out using full insoles and heel raises. Various authors [1,3] have distinguished the effect of compensation achieved by the two treatments. It seems evident that a full insole applied under the shorter limb is able to increase the length of the limb by the height of the insole used. The use of a heel raise, however, does not mean a compensation of limb length discrepancy equal to the height of the raise used.

## 2. Objective

It is not the intention of the authors in this study to establish a protocol for the orthotic compensation of differences in limb length, nor to check the reliability and compatibility of the clinical tests normally used in evaluating limb length discrepancy of the lower limb [1,2,4,5]. The aim of the present study is to determine the increase in effective length of the lower limbs depending on the height of heel raise used. The null hypothesis is that the height of the limb increases by the height of the raise placed under the heel.

## 3. Material and method

The study was carried out in 36 volunteers (23 men and 13 women), podiatry students at Seville University, with a mean age of 24.6 years (between 19 and 31 years old). All subjects provided written consent.

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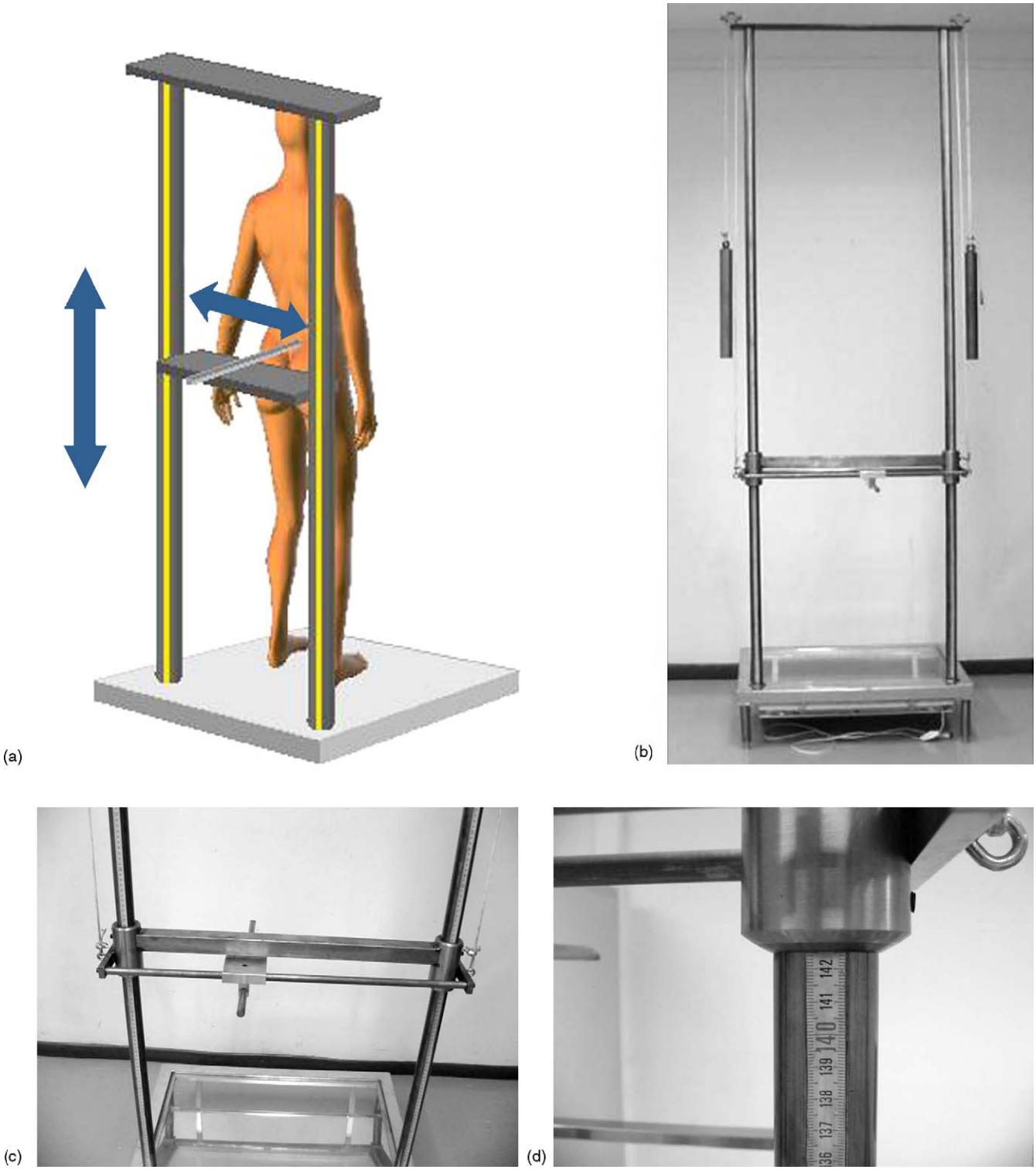


Fig. 1. (a)–(d) Height rod used for the measurements.

In each subject, marks were made on the skin over five anatomical landmarks: the centre of the left popliteal crease, the centre of the right popliteal crease, the left postero-superior iliac spine, the right postero-superior iliac spine, and the spinous process of the seventh cervical vertebra.

The study consisted of measuring the distance of these five marks from the support surface without the use of a raise