

Normative data for the dynamic pedobarographic profiles of children

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Abstract

In order to establish the clinical utility of pedobarography in the treatment of childhood foot pathology, a reliable set of pedobarograph data describing non-pathologic feet is required. The purpose of this study was to describe the pedobarographic profiles of normal children across all ages, with specific focus on young children and explore age-related differences in foot pressure patterns. The Tekscan HR MatTM pressure measurement system was used in a protocol involving a dynamic test at self-selected speed and walking pattern of 146 normal children (age range 1.6–14.9 years). Relative force and timing data were obtained across five foot segments (heel, lateral midfoot, medial midfoot, lateral forefoot, and medial forefoot). Analysis of variance (ANOVA) techniques were applied to determine if there were any age-related differences in foot pressure profiles in children across four *a priori* pedobarograph variables: % of stance at initiation at the heel, % of stance at initiation at the medial midfoot, maximum % force at the heel, maximum % force at the medial midfoot. Differences in foot pressure profiles were distinguished across three age groups: (1) Group 1: <2 years; (2) Group 2: 2–5 years; and (3) Group 3: >5 years. Age-related differences in initiation patterns, force transmission, and the amount of time spent on each foot segment provide evidence for maturation of children's foot pressure profiles from a flatfoot pattern in the young child to a curvilinear pattern in the older child.

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1. Background

Pedobarography is increasingly used in evaluating child foot pathology. Clinical applications include serial measurements to monitor foot pathology over time, evaluation of the effect of treatment or intervention, and assessment of the effectiveness of orthoses [1–9]. Research applications include the development of protocols for acquisition and processing of pedobarographs and evaluation studies on the use of pedobarography in describing the foot [1].

In childhood, foot pathology presents either as a congenital deformity at birth (i.e. clubfoot) or as a developmental deformity that becomes more apparent over

time (i.e. rigid flatfoot seen in tarsal coalition) [10]. Technology that allows comprehensive assessment of foot function has become increasingly available and may contribute in the management patients. In order to appropriately describe foot abnormality, a reliable set of normal values is required for comparison. Previous studies have shown that children's foot pressure profiles change with growth [11–13]. Normal values for different age groups are, therefore, necessary for appropriate age-specific comparisons.

Standardization of data collection and processing techniques provides the basis upon which clinical decisions can be made and research findings compared. It is important to describe foot pressure profiles of the normal population based on a well-defined and reproducible method. Using the Tekscan Pressure Measurement System, Bowen et al. described a method and established the normal pedobarograph parameters of 54 children and adolescents between the ages of 9.6 and 26.4 years [14]. The foot was divided into

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