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Authors [Ming Rong](#), [Yao Dong Gu](#), [Guo Qing Ruan](#)

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Abstract This study aims to evaluate the effectiveness of diabetic therapeutic footwear design in preventing the foot ulcer. A total of 36 type 2 diabetic patients were investigated. The foot plantar pressure was measured with Novel-Pedar insole pressure measure system. The subjects were measured under common leather shoes and common running shoes. Different regions of plantar surface were analyzed. Comparing with two different conditions, Generally, except other toes region, the peak pressure values in running shoes were lower than the leather shoes. Both midfoot and medial forefoot region were significantly different between two intervene. Running shoes might be useful for preventing the diabetic foot ulcer. Because they could reduce the peak pressure effectively than the leather shoes, and make the distribution of the pressure on the foot sole more reasonably.

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A Pilot Study on Footwear Biomechanical Effect to Diabetic Patients

Ming Rong^{1, a}, Yaodong Gu¹, Guoqing Ruan²

¹ Faculty of Sport Science, Ningbo University, Ningbo, China, 315211

² Human Movement Research Lab, Anta Sports Products Limited, Quanzhou, China, 362212

^arongmingnb@gmail.com

Keywords: Diabetic foot. Biomechanics. Footwear

Abstract. This study aims to evaluate the effectiveness of diabetic therapeutic footwear design in preventing the foot ulcer. A total of 36 type 2 diabetic patients were investigated. The foot plantar pressure was measured with Novel-Pedar insole pressure measure system. The subjects were measured under common leather shoes and common running shoes. Different regions of plantar surface were analyzed. Comparing with two different conditions, Generally, except other toes region, the peak pressure values in running shoes were lower than the leather shoes. Both midfoot and medial forefoot region were significantly different between two intervene. Running shoes might be useful for preventing the diabetic foot ulcer. Because they could reduce the peak pressure effectively than the leather shoes, and make the distribution of the pressure on the foot sole more reasonably.

Introduction

It has been well documented that the mechanical pressures applied to the plantar surface of the foot during gait are elevated in patients with diabetes mellitus and peripheral neuropathy [1]. To reduce peak plantar pressure under the foot during human locomotion has been a domain of research interest regarding persons with diabetes, since repetitive mechanical stress [2] and loss of protective sensation [3] on the plantar surface of the foot have been considered the most relevant factors in skin breakdown resulting in diabetic foot ulcerations. During barefoot walking, peak plantar pressures in the diabetic foot have been shown to be higher at the forefoot than the rear-foot [4]. Elevated pressure of the plantar surface under the forefoot in diabetic patients when walking is associated with a force applied to a small area on the plantar surface.

Therefore, the purpose of this study was to compare plantar foot pressures for diabetic patients under normal daily wearing shoes. To determine the underlying mechanism in a possible association between leather shoes and running shoes.

Methods

A total of 36 male patients with type2 diabetes were enrolled, with a mean age of 52.2±12.6 years. Excluded were patients with an active or past history of foot ulcers, those with foot surgery history or those who were unable to walk unaided. We describe the experimental process to the patients before the test, let patients to walk on the test lane first, and start test until their gait gesture become steady. Each patient was randomly assigned wearing the common leather shoes and common running shoes (Fig.1).

TAn in-shoe pressure measurement system (Novel Pedar System, Germany) was employed in this study to measure the plantar exerted on the force sensors of the insole. The thin pressure-measuring insole with 99 force sensors has a linear response to applied loads ranging from 0 to 50 N/cm² with minimal error and has not been shown to interfere with normal gait characteristics. All sensors of the insole were individually calibrated before the testing.