

Biomechanical measurements reveal high heels effect for professional dancers

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With ballroom dancing once again on our screens, all eyes are on the sequins and steps. Well, not quite all eyes. British and Chinese scientists are more interested in the height of the ladies' high heels rather than the torsos and twists and have a few strict words on health and safety for professional dancers.

Researchers Yaodong Gu and James Ren of the Liverpool John Moores University and Jianshe Li and Ming Rong of the Human Movement Research Center, at Ningbo University, China, have investigated the forces exerted on the soles of the feet when dancers take part in a Latin dance. They have used biomechanical measurements on six professional dancers. The load of each sole zone was calculated and the significance of the heel height effect was determined with statistical analysis.

They found that that bare-foot dancing spreads the force evenly between heel and toe, but the higher the shoe heels, the more the force is thrown forward on to the toes. Under controlled testing conditions, dancing in 10 cm high-heels can lead to pressures three times that of the atmosphere being applied to the toes. "Our results indicate that increasing heel height could cause an increase of impact forces in the forefoot and a reduction in the heel region," the team says. "The effect of the heel height in dancing is different from normal gait and the lateral metatarsal region was identified as the most intensely affected zone in dancing." While the team found important differences between barefoot and high-heel, actual heel height change from 4.5, 7.5 and 10 cm, made only limited difference between them, all high-heels were equally as

influential on redistributing the forces on the foot.

"The impact of high-heeled shoes on the human gait kinetic is an important research field," the researchers say. "Most published studies have been focused on the effects of high-heeled shoes on normal walking, while research on more intensive locomotion such as dancing is very limited."

The shift of the high-pressure region from heel to forefoot when dancing in [high-heels](#) can lead to discomfort of the foot and a condition known as plantar fasciitis after prolonged periods of [dancing](#). This finding underlines the importance of the cushioning properties under the forefoot region. The team suggests that testing the stresses on a professional dancers' feet through a detailed biomechanical study can help improve our understanding of human gait and perhaps improve design of dance shoes to reduce the adverse effects associated with high-heeled shoes.

More information: The research is published in the *International Journal of Experimental and Computational Biomechanics*.

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