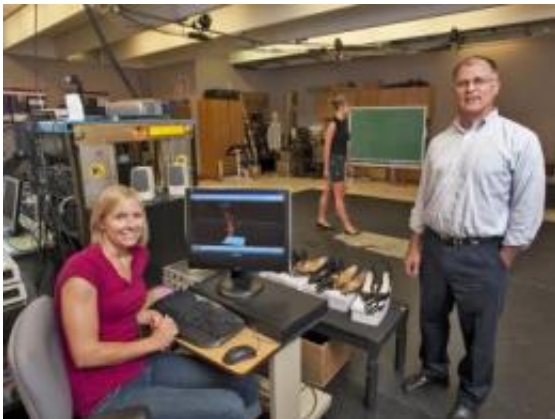


## Study finds high heels may lead to joint degeneration and knee osteoarthritis

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ISU kinesiology master's student Danielle Barkema (left) and kinesiology professor and chair Phil Martin (right) used sensors, accelerometers and lab equipment such as a force platform and markers/cameras while testing subjects, like kinesiology master's student Alison Glidden (center), in their research on prolonged wearing of and walking in high heels. Credit: Photo by Bob Elbert, Iowa State University News Service

While women have been making a fashion statement in high heels for years -- wearing trendy stilettos, wedges, pumps and kitten heels -- there's reason for concern about what those heels may be doing to their knees and joints over time. A new study by an Iowa State University kinesiology master's student has found that prolonged wearing of and walking in heels can contribute to joint degeneration and knee osteoarthritis.

Danielle Barkema, the ISU student who is originally from Cedar Falls, recently completed her thesis research studying the effects of high-heeled walking on forces acting on lower extremity joints. [Kinesiology](#) professor and department head Phil Martin assisted her in the study, which will be presented, in part, at the annual meeting of the American Society of Biomechanics (ASB), Aug. 18-21, at Brown University in Providence, R.I.

"Obviously with research like this, you can't say with any certainty that if you wear high heels regularly you will develop [osteoarthritis](#). We don't know that," Barkema said. "There are probably people [high heel wearers] who do and those who do not. However, based on this information, wearing high heels puts individuals at greater risk for developing osteoarthritis. And it seems to be that the higher the heel height, the greater the risk."

Barkema selected three different heel heights -- flat, two inches, and 3.5 inches-- and had each of the 15 women in her study complete walking trials. She measured the forces acting about the knee joint and the heelstrike-induced shock wave that travels up the body when walking in heels. Using sensors, accelerometers and lab equipment such as a force platform and markers/cameras, she was able to capture motion and force data and translate them into results that could change the way millions of women select their footwear.

While previous studies have examined the effect of high heels on joints, the ISU researchers found that heel height changes walking characteristics such as slower speeds and shorter stride lengths. And as the heels got higher, they also saw an increase in the compression on the inside -- or medial side-- of the knee.

"This means that prolonged wearing and walking in heels could, over time, contribute to joint degeneration and [knee osteoarthritis](#)," Barkema

said.

"I think Danielle's exactly right. Wearing high heels regularly puts a person at risk and the higher the heel, the greater the risk," Martin added. "The loading that's being produced in the joint with every step that they take is higher -- or at least, these data suggest that. These are not direct measures of loading within the joint, but they're an alternative way of looking at that kind of loading."

Barkema also found that in addition to lower extremity joint problems, wearing heels - especially those two inches and higher - alters body posture by changing joint positions at the ankle, knee, hip, and trunk, which can create strain on the lower back.

"Visually, it's quite apparent that somebody's posture is altered when wearing high heels," she said. "We noted those changes in posture [in the study], as well as various joint angles, such as the knee and ankle angle. The most dramatic change occurs at the ankle."

The idea for the research thesis topic actually came from Barkema's twin sister, Ashley, who saw the physical toll regular high heel wear was having on her co-workers.

"Ashley began work as a retail manager at a well-known department store in Chicago a few years ago," Barkema said. "She, as well as most of her co-workers, wore high heels on a daily basis. She noticed a lot of the women, especially older women who had been wearing high heels regularly, had various problems -- problems with their knees and hips, etc."

Barkema's sister served as one of the subjects in the study. And Danielle's not advising her sister to stop wearing high heels altogether.

"I tell my friends to try to wear high heels in moderation and, if possible, to wear lower heels," she said.

The research being presented at the ASB meeting will feature one of the two parts of the study -- focusing on results on tibia acceleration, or impact, in relation to heel height. Those results curiously found the peak impact to be in the two inch heels, with the higher heels actually diminishing the impact similar to the flats.

The researchers plan to submit future papers on all their findings to professional journals.

Provided by Iowa State University

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